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Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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85 URBAN TECHNOLOGY AND TRANSPORTATION **1624**
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For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) **1627**

89 ASTRONOMY **1631**
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **1632**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **1633**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **1634**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **1636**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL **1636**

Note: N.A. means that no abstracts were assigned to this category for this issue.

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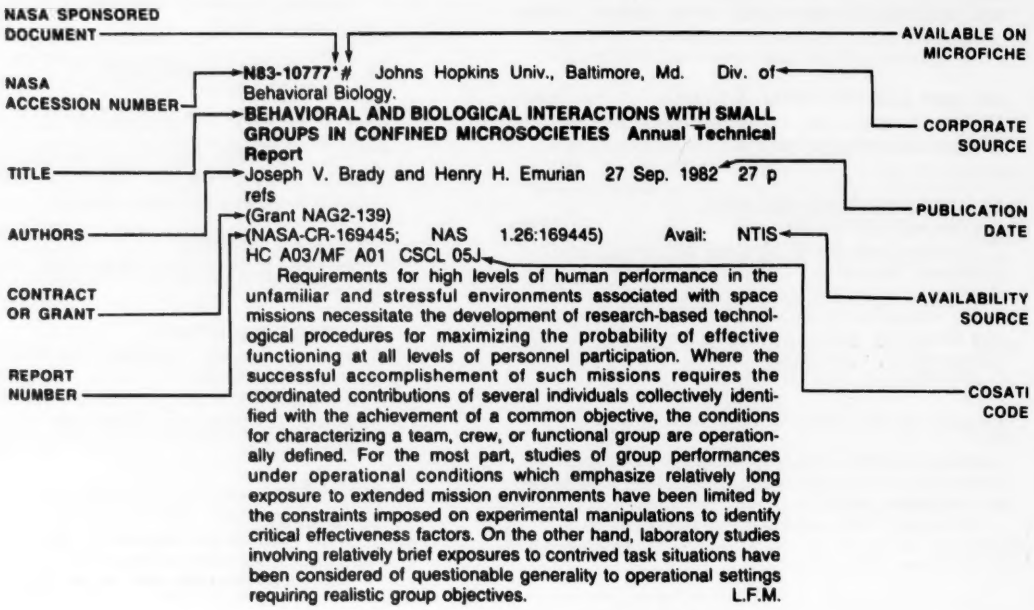
TYPICAL CITATION AND ABSTRACT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NASA ACCESSION NUMBER
N83-10777*# Johns Hopkins Univ., Baltimore, Md. Div. of Behavioral Biology.
CORPORATE SOURCE
TITLE
BEHAVIORAL AND BIOLOGICAL INTERACTIONS WITH SMALL GROUPS IN CONFINED MICROSOCIETIES Annual Technical Report
AUTHORS
Joseph V. Brady and Henry H. Emurian 27 Sep. 1982 27 p refs
PUBLICATION DATE
CONTRACT OR GRANT
(Grant NAG2-139)
REPORT NUMBER
(NASA-CR-169445; NAS 1.26:169445) Avail: NTIS HC A03/MF A01 CSCL 05J
AVAILABILITY SOURCE
COSATI CODE
Requirements for high levels of human performance in the unfamiliar and stressful environments associated with space missions necessitate the development of research-based technological procedures for maximizing the probability of effective functioning at all levels of personnel participation. Where the successful accomplishement of such missions requires the coordinated contributions of several individuals collectively identified with the achievement of a common objective, the conditions for characterizing a team, crew, or functional group are operationally defined. For the most part, studies of group performances under operational conditions which emphasize relatively long exposure to extended mission environments have been limited by the constraints imposed on experimental manipulations to identify critical effectiveness factors. On the other hand, laboratory studies involving relatively brief exposures to contrived task situations have been considered of questionable generality to operational settings requiring realistic group objectives. L.F.M.

VOLUME 21 NUMBER 10/MAY 23, 1983

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N83-19705* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY (SUPPLEMENT 158)
Feb. 1983 135 p
(NASA-SP-7037(158); NAS 1.21:7037(158)) Avail: NTIS HC A07 CSCL 01A

This bibliography lists 499 reports, articles and other documents introduced into the NASA scientific and technical information system in January 1983. Author

N83-19706# Committee on Science and Technology (U. S. House).
AERONAUTICAL RESEARCH
Washington GPO 1983 124 p Hearing before the Subcomm. on Transportation, Aviation and Mater. of the Comm. on Sci. and Technol., 97th Congr., 2d Sess., 14 Dec. 1982
(GPO-14-796) Avail: Subcommittee on Transportation, Aviation and Materials

Aeronautical research is addressed. The aviation industry is examined. Author

N83-19707# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ACTA AERONAUTICA ET ASTRONAUTICA SINICA
Shicun Wang, Zhi Zu, Zenhao Li, Ticusen Ruan, Songshan Yang, Yaonan Gong, Jing Chuan Xue, Yugong Yang, Fuze Zhang, Yajun Lu et al 14 Oct. 1982 156 p refs Transl. into ENGLISH from Hangkong Xuebao (China), v. 3, no. 2, Jun. 1982 p 1-112
(AD-A122742; FTD-ID(RS)T-1035-82) Avail: NTIS HC A08/MF A01 CSCL 20/4

Various topics concerning aircraft structures and aerodynamics are discussed. A simplified method for predicting rotor blade air loads is given. A simplified method for finite element optimization is presented. A Kalman filtering technique is applied to aerodynamic derivatives. R.J.F.

N83-20831*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AMES RESEARCH CENTER OVERVIEW
C. Thomas Snyder *In* American Planning Association Proc. of the Monterey Conf. on Planning for Rotorcraft and Commuter Air Transportation Feb. 1983 p 17-21 (For primary document see N83-20830 10-85)
Avail: NTIS HC A09/MF A01 CSCL 05A

N83-20227# Societe Nationale Industrielle Aerospatiale, Toulouse (France).
APPLICATION OF AN ANALYTICAL METHOD TO THE ELABORATION OF A MAINTENANCE PROGRAM FOR A NEW AIRCRAFT [APPLICATION D'UNE METHODE ANALYTIQUE A L'ELABORATION DU PROGRAMME DE MAINTENANCE D'UN NOUVEL AERONEF]
R. Adam *In* ESA Reliability and Maintainability Sep. 1982 p 345-350 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N83-19708*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NUMERICAL COMPUTATION OF TRANSONIC FLOW GOVERNED BY THE FULL-POTENTIAL EQUATION
Terry L. Holst 1983 114 p refs
(NASA-TM-84310; A-9175; NAS 1.15:84310) Avail: NTIS HC A02/MF A01 CSCL 01A

Numerical solution techniques for solving transonic flow fields governed by the full potential equation are discussed. In a general sense relaxation schemes suitable for the numerical solution of elliptic partial differential equations are presented and discussed with emphasis on transonic flow applications. The presentation can be divided into two general categories: An introductory treatment of the basic concepts associated with the numerical solution of elliptic partial differential equations and a more advanced treatment of current procedures used to solve the full potential equation for transonic flow fields. The introductory material is presented for completeness and includes a brief introduction (Chapter 1), governing equations (Chapter 2), classical relaxation schemes (Chapter 3), and early concepts regarding transonic full potential equation algorithms (Chapter 4). B.W.

N83-19709*# Joint Inst. for Advancement of Flight Sciences, Washington, D. C.
LIFTING SURFACE THEORY FOR A HELICOPTER ROTOR IN FORWARD FLIGHT Final Report
Harry L. Runyan and Hsiang Tai [1983] 19 p refs
(Grant NAG1-13)
(NASA-CR-169997; NAS 1.26:169997) Avail: NTIS HC A02/MF A01 CSCL 01A

A lifting surface theory has been developed for a helicopter rotor in forward flight for incompressible flow. The method utilized the concept of the linearized acceleration potential and make use of the vortex lattice procedures. Results in terms of lift coefficient slope for several forward flight conditions are given. Author

N83-19710*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PREDICTION OF HIGH SPEED PROPELLER FLOW FIELDS USING A THREE-DIMENSIONAL EULER ANALYSIS

Lawrence J. Bober, Denny S. Chaussee (NASA. Ames Research Center), and Paul Kutler (NASA. Ames Research Center) Washington 1983 32 p refs Presented at the 21st Aerospace Sci. Conf., Reno, Nev., 10-13 Jan. 1983; sponsored by AIAA
(NASA-TM-83065; E-1563; NAS 1.15:83065; AIAA-83-0188) Avail: NTIS HC A03/MF A01 CSCL 01A

To overcome the limitations of classical propeller theory, a computer program, NASPROP-E, was developed which solves for the flow field surrounding a multibladed propeller and axisymmetric nacelle combination using a finite difference method. The governing equations are the three dimensional unsteady Euler equations written in a cylindrical coordinate system. They are marched in time until a steady state solution is obtained. The Euler equations require no special treatment to model the blade work vorticity. The equations are solved using an implicit approximate factorization method. Numerical results are presented which have greatly increased the understanding of high speed propeller flow fields. Numerical results for swirl angle downstream of the propeller and propeller power coefficient are higher than experimental results. The radial variation of coefficient are higher than experimental results. The radial variation of swirl angle, however, is in reasonable agreement with the experimental results. The predicted variation of power coefficient with blade angle agrees very well with data.
S.L.

N83-19711*# Massachusetts Inst. of Tech., Cambridge.
FREE WAKE TECHNIQUES FOR ROTOR AERODYNAMIC ANALYSIS. VOLUME 1: SUMMARY OF RESULTS AND BACKGROUND THEORY
R. H. Miller Dec. 1982 48 p refs 3 Vol.
(Grant NAG2-47)
(NASA-CR-166434; NAS 1.26:166434; ASRL-TR-199-1) Avail: NTIS HC A03/MF A01 CSCL 01A

Results obtained during the development of a consistent aerodynamic theory for rotors in hovering flight are discussed. Methods of aerodynamic analysis were developed which are adequate for general design purposes until such time as more elaborate solutions become available, in particular solutions which include real fluids effects. Several problems were encountered in the course of this development, and many remain to be solved, however it is felt that a better understanding of the aerodynamic phenomena involved was obtained. Remaining uncertainties are discussed. Author

N83-19712*# Massachusetts Inst. of Tech., Cambridge.
FREE WAKE TECHNIQUES FOR ROTOR AERODYNAMIC ANALYLIS. VOLUME 2: VORTEX SHEET MODELS
A. Tanuwidjaja Dec. 1982 162 p 3 Vol.
(Grant NAG2-47)
(NASA-CR-166435; NAS 1.26:166435; ASRL-TR-199-2) Avail: NTIS HC A08/MF A01 CSCL 01A

Results of computations are presented using vortex sheets to model the wake and test the sensitivity of the solutions to various assumptions used in the development of the models. The complete codings are included. Author

N83-19713*# Massachusetts Inst. of Tech., Cambridge.
FREE WAKE TECHNIQUES FOR ROTOR AERODYNAMIC ANALYSIS. VOLUME 3: VORTEX FILAMENT MODELS
Michael Brower Dec. 1982 69 p 3 Vol.
(Grant NAG2-47)
(NASA-CR-166436; NAS 1.26:166436; ASRL-TR-199-3) Avail: NTIS HC A04/MF A01 CSCL 01A

Results obtained using a vortex filament model, as opposed to sheets are discussed, against using various modeling techniques and including the computer codings. Author

N83-19714*# North Carolina State Univ., Raleigh. Dept. of Mechanical and Aerospace Engineering.
SUBSONIC BALANCE AND PRESSURE INVESTIGATION OF A 60 DEG DELTA WING WITH LEADING EDGE DEVICES
Stephen A. Tingas and Dhanvada M. Rao (Vigyan Research Associates, Inc., Hampton, Va.) Hampton, Va. NASA. Langley Research Center May 1982 215 p refs
(Contract NCC1-46)
(NASA-CR-165923; NAS 1.26:165923) Avail: NTIS HC A10/MF A01 CSCL 01A

Low supersonic wave drag makes the thin highly swept delta wing the logical choice for use on aircraft designed for supersonic cruise. However, the high-lift maneuver capability of the aircraft is limited by severe induced-drag penalties attributed to loss of potential flow leading-edge suction. This drag increase may be alleviated through leading-edge flow control to recover lost aerodynamic thrust through either retention of attached leading-edge flow to higher angles of attack or exploitation of the increased suction potential of separation-induced vortex flow. A low-speed wind-tunnel investigation was undertaken to examine the high-lift devices such as fences, chordwise slots, pylon vortex generators, leading-edge vortex flaps, and sharp leading-edge extensions. The devices were tested individually and in combinations in an attempt to improve high-alpha drag performance with a minimum of low-alpha drag penalty. This report presents an analysis of the force, moment, and static pressure data obtained in angles of attack up to 23 deg, at Mach and Reynolds numbers of 0.16 and 3.85 x 10 to the 6th power per meter, respectively. The results indicate that all the devices produced drag and longitudinal/lateral stability improvements at high lift with, in most cases, minor drag penalties at low angles of attack. Author

N83-19715*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PUMPED VORTEX Patent Application
L. Robert Jackson and Allan H. Taylor, inventors (to NASA) Filed 10 Jan. 1983 14 p
(NASA-Case-LAR-12615-1; US-Patent-Appl-SN-456915) Avail: NTIS HC A02/MF A01 CSCL 01A

A system for increasing vortex lift and delaying vortex breakdown in aircraft is described. A turbofan or turbojet engine is located near and slightly above the trailing edge of an aircraft wing which produces a leading edge vortex system. The engine is located such that the leading edge vortex is centered on and forms the engine input stream. Suction produced by the engine inlet serves to pump (increase the velocity of), the core flow and surrounding high energy vortex flow of the vortex system. Pumping the core and surrounding flows near the trailing edge of the wing creates a more negative pressure above the wing, thereby increasing lift. Pumping the core flow also delays vortex breakdown which occurs at high angles of attack. The downstream vortex is rendered less turbulent, that is, lower in vorticity, thus less dangerous to following aircraft. NASA

N83-19716# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.
UNSTEADY FLOW OVER AEROFOILS WITH SEPARATION Final Scientific Report, 1 Apr. 1981 - 30 Sep. 1982
J. M. R. Graham 1 Oct. 1982 27 p refs
(Grant AF-AFOSR-0050-81)
(AD-A122070; EOARD-TR-82-2) Avail: NTIS HC A03/MF A01 CSCL 20/4

The mean and fluctuating components of surface pressure and lift have been measured on a NACA 0012 aerofoil in an unsteady flow gust tunnel giving a mean flow with streamwise fluctuations of variable amplitude and frequency. The tests were carried out for a range of aerofoil incidences from 10 deg (attached flow) to 20 deg (separated flow) at mean chord Reynolds number of 1.2 x 105. Some comparisons of the results are made with unsteady aerofoil theory. GRA

N83-19717# Iowa Inst. of Hydraulic Research, Iowa City.
ANALYSIS OF TURBULENT NEAR WAKES Final Report, Oct. 1980 - Aug. 1982
A. Prabhu and V. C. Patel Aug. 1982 40 p refs
(Contract N00014-82-K-0200)
(AD-A121777; IIHR-253) Avail: NTIS HC A03/MF A01 CSCL 20/4

This report is concerned with the analytical treatment of the

flow in the near wake behind sharp trailing edges with a fully-developed zero-pressure gradient turbulent boundary layer just upstream of the trailing edge. The three cases considered are the flows behind two dimensional, axisymmetric and infinitely-yawed sharp trailing edges. The principal limits that govern the near wake seem to be Square root of C sub f as it approaches 0 and Square root of C sub f x R sub sigma as it approaches infinity, where C sub f and R sub sigma are the skin friction in the upstream boundary layer and the Reynolds number based on shear layer thickness, respectively. This is the same limit as that for the local asymptotic analysis of a fully-developed turbulent boundary layer under zero pressure gradient at large Reynolds numbers. These limiting conditions lead to the governing equations for the inner and outer near-wake and a logarithmic variation of the velocity in the overlapping region. It is argued that the same limiting conditions also lead to a logarithmic variation of the centerline velocity in the near wake. Similarity solutions have been obtained for the governing equations of the inner and outer near-wakes. Limited comparisons with experiments for a two dimensional flow show that the variation of the scales and profiles predicted agree reasonably well with experiments. GRA

N83-19718# Rockwell International Corp., Thousand Oaks, Calif.
COMPUTATIONAL TREATMENT OF TRANSONIC CANARD-WING INTERACTIONS Interim Report
Vijaya Shankar and Norman D. Malmuth Jan. 1982 11 p refs Presented at the AIAA 20th Aerospace Sci. Meeting, Orlando, Fla., 11-14 Jan. 1982 Original document was announced as A82-17814
(Contract F49620-80-C-0081; AF Proj. 2307)
(AD-A121662; AFOSR-82-1007TR) Avail: NTIS HC A02/MF A01 CSCL 20/4

The transonic canard-wing interaction problem is simulated using modified small disturbance (MSD) transonic theory. The wing and the canard are treated in a sheared fine grid system that is embedded in a global Cartesian crude grid. An appropriate far field and asymptotic expression for the velocity potential derived using Green's theorem is implemented. Results are presented for a few canard-wing configurations and compared with available experimental data. The weakening of the wing shock due to the presence of the canard downwash is illustrated in terms of contour plots. An empirical incidence correction for the wing leading edge vortex gives good agreement with experiment at low incidences. For higher angles of attack, the results indicate that a more sophisticated vortex roll-up and induction model is required. Author (IAA)

N83-19719# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
TRANSONIC AND NONLINEAR FLOW RESEARCH Final Report, 1 Jun. 1980 - 28 Feb. 1982
N. D. Malmuth, J. D. Cole, C. C. Wu, and F. Zeigler May 1982 97 p refs Prepared in cooperation with the California Univ. and Wisconsin Univ.
(Contract F49620-80-C-0081; AF Proj. 2307)
(AD-A121477; SC5267.3FR; AFOSR-82-0954TR) Avail: NTIS HC A05/MF A01 CSCL 08/10

The research program consists of the investigation of transonic slender body theory and optimization procedures as well as asymptotic methods for wind-tunnel interference in the supercritical regime. For the slender body portion, two areas received attention. In the first, the existence of an unsteady equivalence rule has been verified in which the outer solution is governed by axisymmetric unsteady small disturbance theory subject to an unsteady line source internal boundary condition and far field. As in the steady case, the strength of the line source depends on an inner solution for the potential, which is harmonic in cross planes to the flow. This solution specifies the line source intensity in terms of a rate of change of the cross sectional area distribution in which the unsteady motion of the body surface is taken into account. The second aspect of the research effort deals with optimization of slender lifting wing-body combinations. A restricted class of these shapes has been considered in which the wing span increases monotonically from a common apex with the body. For the wall interference portion of the effort, the method of matched asymptotic expansions is utilized to study the singular perturbation problem relevant to transonic airfoils confined by large height to chord ratio solid walls. GRA

N83-19720# Science Research Council, Chilton (England).
SERC STABILIZED BALLOON PLATFORMS ROLL GIMBAL LOAD TEST
P. K. Green 1982 16 p refs
(PB82-246885; RL-82-042) Avail: NTIS HC A02/MF A01 CSCL 01C

An ultimate load test has been carried out on a specimen roll gimbal unit of the SERC stabilized balloon platforms simulating loading at 90 degrees platform elevation angle. The unit and attachments to the platforms have been shown to be capable of meeting the 5 g 'no damage' and 10 g 'no fracture' cases. Test loads were derived from a platform flight weight, without ballast, of 1130 kg. GRA

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N83-19721*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TIME SCHEDULING OF A MIX OF 4D EQUIPPED AND UN-EQUIPPED AIRCRAFT
Leonard Tobias Feb. 1983 17 p refs
(NASA-TM-84327; A-9225; NAS 1.15:84327) Avail: NTIS HC A02/MF A01 CSCL 01C

In planning for a future automated air traffic system, it is necessary to confront the transition situation in which some percentage of the traffic must be handled by conventional means. A safe, efficient transition system is needed since initially not all aircraft will be able to respond to a more automated system. The specific problem addressed was that of time scheduling a mix of 4D-equipped aircraft (aircraft that can accurately meet a controller specified time schedule at selected way points in the terminal area) when operating in conjunction with unequipped aircraft (aircraft that require air traffic handling by means of standard vectoring techniques). First, a relationship between time separation and system capacity was developed. The time separations were incorporated into a set of scheduling algorithms which contain the required elements of flexibility needed for terminal-area operation, such as delaying aircraft and changing time separations. The problem of reducing the size of time separations allotted for vectored aircraft by means of computer assists to the controller was also addressed. B.G.

N83-19722# General Dynamics/Fort Worth, Tex.
ADVANCED ULTRA-VIOLET (UV) AIRCRAFT FIRE DETECTION SYSTEM. VOLUME 2: SYSTEM HARDWARE DESIGN, SOFTWARE DESIGN, AND TEST Final Report, 15 Dec. 1977 - 26 Oct. 1981
Wright-Patterson AFB, Ohio AFWAL Aug. 1982 512 p refs
(Contract F33615-77-C-2029; AF Proj. 2348)
(AD-A121721; AFWAL-TR-82-2062-Vol-2) Avail: NTIS HC A22/MF A01 CSCL 01/2

The objective of this program was to utilize ultra-violet (UV) radiation technology to provide advanced means of detecting fire hazards more reliably and more rapidly than current thermally activated continuous cable type system. This volume, Volume 2, of three volumes provides detail information on the development, circuit/software design and qualification testing of the system component. Author (GRA)

N83-19723# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.

AIRCRAFT ACCELERATION SENSITIVE INERTIA REEL LOCK
Thomas J. Zenobi 1982 10 p
(AD-A122208; NADC-82249-10) Avail: NTIS HC A02/MF A01 CSCL 13/5

The Navy has built and tested an aircraft acceleration sensitive inertia reel lock for crewmember positioning and restraint during eyeballs out (-gx) accelerations, primarily during an aircraft flat spin. The design is simple and retrofitting to many ejection seats. Centrifuge tests at NADC indicate the locking device performs effectively and reliably. GRA

N83-19724# Air Force Academy, Colo. Flight Dynamics Lab.
CATAPULT DYNAMICS IN A HIGH ACCELERATION ENVIRONMENT Final Report, 1 Oct. 1979 - 30 Sep. 1981
A. M. Higgins 15 Oct. 1982 79 p refs
(AD-A122314; USAFA-TN-82-5) Avail: NTIS HC A05/MF A01 CSCL 01/2

This paper presents the results of a test program in which ejection catapults were test fired both in an environment of zero acceleration (catapult horizontal) and in a high acceleration environment. These test results showed a marked effect of G loading on the catapult dynamics. The catapult pressures, for example, were significantly higher. This paper also describes an attempt made to construct a computer model which would predict the catapult's dynamics under any G loading. A discussion of the model results is included, as is the computer model program. Author (GRA)

N83-19725# Army Aviation Research and Development Command, St. Louis, Mo. Applied Technology Lab.
VERIFICATION TESTING OF A UH-1 WIRE STRIKE PROTECTION SYSTEM (WSPS)
LeRoy T. Burrows Nov. 1982 28 p ref
(AD-A122220; USAAVRADCOM-TR-82-D-35) Avail: NTIS HC A03/MF A01 CSCL 01/2

In-flight wire strikes poses a serious threat to low-level helicopter operations. Under the sponsorship of Headquarters, US Army Aviation Research and Development Command (AVARADCOM) tests were conducted by ATL to determine the suitability for UH-1H helicopter application of a Wire Strike Protection System (WSPS) manufactured by Bristol Aerospace Limited (BAL). The WSPS initially tested consisted of fuselage-mounted upper and lower cutters and a windshield centerpost deflector with a sawtooth cutter. Using the NASA-Langley Research Center's Impact Dynamics Research Facility, a UH-1H helicopter fitted with the WSPS was subjected to pendulum swing tests in which the helicopter struck strung wires at approximately 40 knots airspeed. The WSPS demonstrated its capability to sever an 11,500-pound tensile strength steel, seven-strand 3/8 guy wire. Also, a significant wire-cutting limitation peculiar to the UH-1H was identified. At wire impact 30 degrees from the normal to the flight path, it was demonstrated that the wire could be snagged by the windshield wiper shaft, preventing the wire from being deflected into the upper cutter. As a result, BAL and ATL analyzed the situation and both concluded that a simple windshield wiper shaft deflector could alleviate the problem. Windshield wiper shaft deflectors fabricated by BAL were installed on the test aircraft and additional swing tests were conducted. Successful deflection and wire cutting were demonstrated. Installation of the WSSPS, as modified by this effort, on the Army's UH-1H helicopter fleet is recommended. GRA

N83-19726# Federal Aviation Administration, Washington, D.C. Intelligence and International Security Div.
EFFECTIVENESS OF THE CIVIL AVIATION SECURITY PROGRAM Semiannual Report, 1 Jan. - 30 Jun. 1982
26 Oct. 1982 44 p
(AD-A122707; DOT/FAA/ACS-82-16; SAR-16) Avail: NTIS HC A03/MF A01 CSCL 01/3

The report includes an analysis of the current threat against civil aviation along with information regarding hijacking attempts, security incidents, bomb threats, and passenger screening activity. It also summarizes ongoing activities to assure adequate protection of civil air commerce against hijacking/sabotage and related crimes, and other aspects of the Civil Aviation Security Program. Author (GRA)

N83-19727# National Bureau of Standards, Washington, D.C. National Engineering Lab.
AN ASSESSMENT OF CORRELATIONS BETWEEN LABORATORY AND FULL-SCALE EXPERIMENTS FOR THE FAA AIRCRAFT FIRE SAFETY PROGRAM. PART 1: SMOKE
James G. Quintiere Atlantic City, N.J. FAA Jul. 1982 54 p refs 5 Vol.
(PB83-113522; NBSIR-82-2508-Pt-1; DOT/FAA/CT-82/100-Pt-1) Avail: NTIS HC A04/MF A01 CSCL 01C

An extensive review is presented demonstrating the nature of comparison between full-scale fire smoke data and test method results for materials. These correlations are presented in terms of consistent parameters established through a development of the governing equations for smoke concentration and light attenuation. Visibility data pertaining to light transmission through smoke is presented, but no general results exist on the sensory irritant effect of smoke on vision. Analysis shows the complex dependence on smoke production on many parameters acting in fire growth and shows the futility and nature of simple correlation attempts. Recommendations are made for further research to establish a sounder basis for correlations, and a practical strategy is suggested. GRA

N83-19728# National Bureau of Standards, Washington, D.C. National Engineering Lab.
AN ASSESSMENT OF CORRELATIONS BETWEEN LABORATORY AND FULL-SCALE EXPERIMENTS FOR THE FAA AIRCRAFT FIRE SAFETY PROGRAM. PART 2: RATE OF ENERGY RELEASE IN FIRE
James G. Quintiere Atlantic City, N.J. FAA Jul. 1982 25 p refs 5 Vol.
(PB83-113530; NBSIR-82-2536-Pt-2; DOE/FAA/CT-82/108-Pt-2) Avail: NTIS HC A02/MF A01 CSCL 01C

The rate of energy release in fire is discussed. The significance of calorimetric measurements of energy release for materials is related to thermal-dynamic parameters, namely heat of reaction and stoichiometric coefficients. It is shown that a common set of parameters is necessary to express ignition, flame spread and mass loss due to combustion and heat transfer in fires. The relationship of ignition and flame spread to rate of energy release in fires is presented along with a presentation on upward spread. Author (GRA)

N83-19729# National Bureau of Standards, Washington, D.C. National Engineering Lab.
AN ASSESSMENT OF CORRELATIONS BETWEEN LABORATORY AND FULL-SCALE EXPERIMENTS FOR THE FAA AIRCRAFT FIRE SAFETY PROGRAM. PART 4: FLAMMABILITY TESTS
James G. Quintiere Atlantic City, N.J. FAA Jul. 1982 28 p refs 5 Vol.
(PB83-113548; DOT/FAA/CT-82/101-Pt-4; NBSIR-82-2525-Pt-4) Avail: NTIS HC A03/MF A01 CSCL 01C

Full-scale fire growth studies were compared with laboratory test data on materials. Both room and corridor fires are included in which primarily interior lining materials were combustible element. The studies include standard test methods and other laboratory devices. An effort was made to intercompare experimental results in a common basis. For example, maximum room temperature data are compared with ASTM E-84 flame spread classifications for several full-scale tests which involved nearly the same room geometries and same fuel arrangements. GRA

N83-19730# National Bureau of Standards, Washington, D.C. National Engineering Lab.
AN ASSESSMENT OF CORRELATIONS BETWEEN LABORATORY AND FULL-SCALE EXPERIMENTS FOR THE FAA AIRCRAFT FIRE SAFETY PROGRAM. PART 5: SOME ANALYSES OF THE POST CRASH FIRE SCENARIO

James G. Quintiere and Takeyoshi Tanaka (Building Research Inst.) Atlantic City, N.J. FAA Jul. 1982 27 p refs 5 Vol.
(PB83-113555; NBSIR-82-2537-Pt-5; DOT/FAA/CT-82/107-Pt-5) Avail: NTIS HC A03/MF A01 CSCL 01C

An attempt is made to develop mathematical predictions for various aspects of the dynamics of post-crash aircraft fires. The basis of the analysis is the experimental simulation scenario under study by the FAA. The effects of wind are considered as well as the effect of interior and exterior fires. Suggestions are presented for estimating cabin door flow rates from measured temperatures. Author (GRA)

N83-19731# Office of Technical Services, Washington, D. C.
IMPACT OF ADVANCED AIR TRANSPORT TECHNOLOGY. PART 4: FINANCING AND PROGRAM ALTERNATIVES FOR ADVANCED HIGH-SPEED AIRCRAFT
Aug. 1982 52 p refs
(PB83-110585; OTA-BP-T-14) Avail: NTIS HC A04/MF A01 CSCL 01C

The potential financial and managerial barriers to carrying out a large scale program to create a new, long range commercial air transport employing new technology is discussed. The structure and financing practices of the conventional aircraft industry are described. A broad assessment of the economic, environmental, energy, societal, and safety aspects of technological advances that might occur in several types of transport aircraft are evaluated. Author (GRA)

N83-20188# Societe Nationale Industrielle Aerospatiale, Toulouse (France).
DEMONSTRATION OF AN ACCEPTABLE SAFETY LEVEL FOR DIGITAL EQUIPMENT ON BOARD CIVIL TRANSPORT AIRCRAFT [DEMONSTRATION D'UN NIVEAU ACCEPTABLE DE SECURITE DES EQUIPMENTS NUMERIQUES A BORD DES NOUVEAUX AVIONS DE TRANSPORT CIVILS]
P. Toulouse *In* EAS Reliability and Maintainability Sep. 1982 p 65-69 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20834*# Helicopter Association International, Washington, D.C.
ROTORCRAFT AIR TRANSPORTATION
Glen A. Gilbert *In* American Planning Association Proc. of the Monterey Conf. on Planning for Rotorcraft and Commuter Air Transportation Feb. 1983 p 73-83 (For primary document see N83-20830 10-85)
Avail: NTIS HC A09/MF A01 CSCL 01C

N83-20836*# Vitro Labs., Silver Spring, Md.
COMMUNITY ROTORCRAFT AIR TRANSPORATION: OPPORTUNITIES AND BENEFITS
D. J. Freund *In* American Planning Association Proc. of the Monterey Conf. on Planning for Rotorcraft and Commuter Air Transportation Feb. 1983 p 96-106 (For primary document see N83-20830 10-85)
Avail: NTIS HC A09/MF A01 CSCL 01C

N83-20837*# Vought Corp., Dallas, Tex.
LESSONS FROM THE PAST: STOL SYSTEM STUDIES AND OTTAWA-MONTREAL STOL DEMONSTRATION
Robin Ransone *In* American Planning Association Proc. of the Monterey Conf. on Planning for Rotorcraft and Commuter Air Transportation Feb. 1983 p 107-113 refs (For primary document see N83-20830 10-85)
Avail: NTIS HC A09/MF A01 CSCL 01C

N83-20838*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OPPORTUNITIES AND BENEFITS
Thomas L. Galloway *In* American Planning Association Proc. of the Monterey Conf. on Planning for Rotorcraft and Commuter Air Transportation Feb. 1983 p 118-136 refs (For primary document see N83-20830 10-85)
Avail: NTIS HC A09/MF A01 CSCL 01C

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N83-19732# Boeing Commercial Airplane Co., Seattle, Wash.
TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM: DEVELOPMENTAL SIMULATION Final Report, 1981 - Apr. 1982
G. P. Boucek, Jr., R. W. White, W. D. Smith, and J. M. Kraus Washington FAA Jul. 1982 190 p refs Sponsored by FAA
(FAA-RD-82-49) Avail: NTIS HC A09/MF A01

One of a series of studies being conducted to develop the Traffic Alert and Collision Avoidance System (TCAS) is described. The purpose of this study was to investigate display technology appropriate for the presentation of TCAS information on both conventional and advanced flight decks. The alerting effectiveness of candidate TCAS display concepts, the variability of including a caution level alert (TA) that would precede the warning (RA), minimum information requirement for the RA and TA, and a TCAS display concept to be used in the operational simulation were studied. In the tests, experienced transport pilots were presented TCAS alerts while flying a transport simulator. Their responses to the alerts were recorded as were their opinions about the system. Author

N83-19733# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Reference Systems Branch.
STRAPDOWN TECHNOLOGY DEVELOPMENT Final Report, 1 Oct. 1978 - 1 Oct. 1982
Jay N. Burns Sep. 1982 75 p
(AF Proj. 6095)
(AD-A120974; AFWAL-TR-82-1124) Avail: NTIS HC A04/MF A01 CSCL 17/7

This effort was intended to provide an opportunity for becoming familiar with strapdown inertial navigation hardware and the software necessary for alignment and navigation. To that end a Honeywell H-478 inertial sensor assembly was selected for experimentation. A significant portion of the effort was involved with designing and building an interface unit to permit outputs to be processed on the PDP 11/40 computer. An alignment computer program was written to provide coarse and fine alignment using H-478 sensor output data. Also the output data was used to drive a strapdown navigation computer model. GRA

N83-19734# Michigan Univ., Ann Arbor. Radiation Lab.
STUDY OF RERADIATION OF LORAN-C IN A HARBOR ENVIRONMENT Final Report, Apr. 1981 - Jun. 1982
Valdis V. Liepa and Robert L. Frank 8 Jun. 1982 237 p refs
(Contract DTCG23-81-C-20012)
(AD-A120624; CG-D-37-82; Rept-018958-1-F) Avail: NTIS HC A11/MF A01 CSCL 17/7

The degradation of Loran-C accuracy near overhead conductors such as bridges and power lines was studied. Using a small scale model of the Golden Gate Bridge, amplitude and phase measurements were performed for numerous illumination and position bearings at a variety of distances from the bridge. By sweeping frequency over a 5:1 range, one model simulated a 5:1 range of bridge sizes. The data confirm that up to resonance the large structures can produce large errors (the Golden Gate and Verrazano Narrows bridges are only ten percent below resonant size at 100 kHz) and the smaller bridges produce much smaller errors. The directions of wave incidence and measurement

relative to the bridge greatly affect the error, with broadside incidence being worst. The data are compared with full scale measurements. To improve the understanding of how the errors occur, measurements were carried out using (modified) bridge models with insulators replacing metallic portions. The relationship between reradiation from bridges and power lines is discussed and similarities noted. GRA

N83-19735# CeleNav Industries, Inc., Charlestown, W. Va.
AVERAGED DIGITAL SEXTANT (ADS) FOR FINS INTEGRATION Final Report, 1 Jan. - 20 Sep. 1982
Fred A. Leuchter, Jr. 20 Sep. 1982 12 p refs
(Contract N00014-82-C-0118)
(AD-A122094; CNI-SXT-9-82) Avail: NTIS HC A02/MF A01 CSCL 09/2

This is the final report on the Averaged Digital Sextant for FINS Integration. The engineering model has not been completed at the time of this report due to mechanical problems with the housing and index arm assembly. However, enough has been accomplished to make a determination that the Sextant and the rotary drum encoder are completely feasible from a production stand point. The materials covered by this report include the housing and mechanical design, the problems with conventional sextant parts, the optics, the electrical design and the fabrication of the instrument and the changes made each step of the way to produce a low cost instrument. The encoder, being the heart of the instrument, is covered in the greatest detail. This final report covering work performed from 1 January 1982 thru 30 September 1982. Work performed includes: determination of instrument specifications; determination of test parameters; determination of test procedures; definition of evaluation process; engineering of model concept; engineering of model hardware; design/drafting preliminary; final design; re-design of present sextant hardware; design changes for processing electronics; evaluation of parts; assembly; debug; evaluation of problems; remedies and recommendations for problems; and final determination. GRA

N83-19736# Raytheon Co., Sudbury, Mass. Equipment Div.
AZIMUTH DETERMINATION USING A LOW NOISE RING LASER GYRO INERTIAL MEASUREMENT UNIT Final Report
James B. Matthews, Morris I. Gneses, and Donald J. Pasik 30 Nov. 1982 15 p refs Presented at the AIAA Guidance and Control Conf., Albuquerque, N. Mex., 19-21 Aug. 1981 Previously announced as A82-13994
(Contract F19620-80-C-0182; AF Proj. DM32)
(AD-A122140; AFGL-TR-82-0356) Avail: NTIS HC A02/MF A01 CSCL 17/7

The performance requirements for a ring laser gyro inertial measurement system to achieve sub-arc second azimuth determination capability have been developed. Parallel theoretical studies link these requirements to identifiable laser gyro design parameters and indicate that a feasible design could be implemented within practical constraints. A feasibility system is being assembled which will consist of 3 Raytheon RB-25 multioscillator gyros and 3 Bell Aerospace Model XI accelerometers. The instrument cluster will be mounted on a single-degree-of-freedom rotary fixture. Rotation of the cluster will be used to washout long-term error contributors with a Kalman filter using a pseduovelocity measurement technique. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N83-19737* National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
AIRCRAFT CANOPY LOCK Patent
George H. Nichols, inventor (to NASA) Issued 30 Mar. 1981 6 p Filed 30 Mar. 1981 Supersedes N81-24047 (19 - 15, p 2007)
(NASA-Case-FRC-11065-1; US-Patent-4,375,281; US-Patent-Appl-SN-248744; US-Patent-Case-244-121; US-Patent-Case-244-129.4; US-Patent-Case-292/254) Avail: US Patent and Trademark Office CSCL 01C

A manually-operable lock for releasably securing a canopy in closed condition is described.

Official Gazette of the U.S. Patent and Trademark Office

N83-19738*# Kansas Univ. Center for Research, Inc., Lawrence. Flight Research Lab.
A METHOD OF PREDICTING FLOW RATES REQUIRED TO ACHIEVE ANTI-ICING PERFORMANCE WITH A POROUS LEADING EDGE ICE PROTECTION SYSTEM Final Report
David L. Kohlman Feb. 1983 27 p refs
(Grant NAG3-71)
(NASA-CR-169996; NAS 1.26:169996; KU-FRL-464-5) Avail: NTIS HC A03/MF A01 CSCL 01C

A proposed method of analytically predicting the minimum fluid flow rate required to provide anti-ice protection with a porous leading edge system on a wing under a given set of flight conditions is presented. Results of the proposed method are compared with the actual results of an icing test of a real wing section in the NASA Lewis Icing Research Tunnel. Author

N83-19739*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MATHEMATICAL MODEL OF THE SH-3G HELICOPTER
James D. Phillips Dec. 1982 56 p refs
(NASA-TM-84316; A-9187; NAS 1.15:84316) Avail: NTIS HC A04/MF A01 CSCL 01C

A mathematical model of the Sikorsky SH-3G helicopter based on classical nonlinear, quasi-steady rotor theory was developed. The model was validated statically and dynamically by comparison with Navy flight-test data. The model incorporates ad hoc revisions which address the ideal assumptions of classical rotor theory and improve the static trim characteristics to provide a more realistic simulation, while retaining the simplicity of the classical model. Author

N83-19740*# Boeing Vertol Co., Philadelphia, Pa.
VARIABLE CAMBER ROTOR STUDY
L. Dadone, J. Cowan, and F. J. McHugh Aug. 1982 227 p refs
(Contract NAS2-10768)
(NASA-CR-166382; NAS 1.26:166382; D210-11938-1) Avail: NTIS HC A11/MF A01 CSCL 01C

Deployment of variable camber concepts on helicopter rotors was analytically assessed. It was determined that variable camber extended the operating range of helicopters provided that the correct compromise can be obtained between performance/loads gains and mechanical complexity. A number of variable camber concepts were reviewed on a two dimensional basis to determine the usefulness of leading edge, trailing edge and overall camber variation schemes. The most powerful method to vary camber was through the trailing edge flaps undergoing relatively small motions (-5 deg to +15 deg). The aerodynamic characteristics of the NASA/Ames A-1 airfoil with 35% and 50% plain trailing edge flaps were determined by means of current subcritical and transonic airfoil design methods and used by rotor performance and loads analysis codes. The most promising variable camber schedule reviewed was a configuration with a 35% plain flap deployment in an on/off mode near the tip of a blade. Preliminary results show approximately 11% reduction in power is possible at 192 knots and a rotor thrust coefficient of 0.09. The potential demonstrated indicates a significant potential for expanding the operating envelope of the helicopter. Further investigation into improving the power saving and defining the improvement in the operational envelope of the helicopter is recommended. B.G.

N83-19741*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
METHODS FOR ESTIMATION OF BULLEN TURBULENCE SPECTRUM PARAMETERS Final Report

W. D. Mark May 1982 21 p refs
(Contract NAS1-14837)
(NASA-CR-165912; NAS 1.26:165912) Avail: NTIS HC A02/MF A01 CSCL 01C

Maximum likelihood and constrained least-squares methods are extended to Bullen transverse and longitudinal spectra and autocorrelation functions. Author

N83-19742# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.

A STUDY OF ALTERNATIVE AIRCRAFT FOR INSTALLATION OF THE NAVY STANDARD TOW TARGET SYSTEM Final Report

A. Berg 30 Jun. 1982 49 p refs
(AD-A120882; NADC-82195-60) Avail: NTIS HC A03/MF A01 CSCL 01/3

This report analyzes the suitability of various alternative tractor aircraft for both shore and carrier based tow target operations. The investigation considered performance, mechanical/electrical compatibility, and advantages/disadvantages of each type aircraft studied. GRA

N83-19743# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.

HANDBOOK OF MILITARY AIRCRAFT DESIGN NORMAL LOAD FACTOR EXCEEDANCE DATA Interim Report, Sep. 1965 - Mar. 1982

Ray J. Veldman and Cyril G. Peckham Oct. 1982 120 p refs
(AD-A120870; ASD-TR-82-5012) Avail: NTIS HC A06/MF A01 CSCL 20/11

The information presented in this handbook is derived from airborne data recorded using oscillograph and magnetic tape systems collecting Loads Environment Spectra Survey Data on a multitude of USAF aircraft. The data is broken down into three main categories: Cargo Class, Fighter/Attack Class, and Trainer class. Special information included in the handbook are Ground Data from the C-141 and Aerial Refueling from the C-5. The data is broken down by aircraft, mission, and mission phase. Plots are provided and show comparisons of different aircraft models. The tables presented express NZ (normal load factor) in exceedances per 1000 flight hours and ground data in exceedances per 1000 flights. GRA

N83-19744# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.

STATISTICAL REVIEW OF COUNTING ACCELEROMETER DATA FOR NAVY AND MARINE FLEET AIRCRAFT Semiannual Summary Report, 1 Jan. 1962 - 31 Dec. 1981

Warren J. Williams 1 May 1982 157 p
(AD-A121989; NADC-13920-2) Avail: NTIS HC A08/MF A01 CSCL 01/1

This is a semi-annual progress report, and it presents a specialized summary of the data in the counting accelerometer program. Statistics describing Navy and Marine aircraft cumulative g-count exceedances are calculated and tabulated. These tabulations are separated by calendar time and into four major categories of fleet experience: Navy Training, Navy Combat, Marine Training, and Marine Combat. These data show that the load rate distributions (counts at 1000 hours) for most models and most g-levels have a non-normal distribution. Within a model (A-7E, F-4N, etc.) differences in the average load rates exist when data are separated by calendar time or mission category. GRA

N83-19745# Notre Dame Univ., Ind. Dept. of Aerospace and Mechanical Engineering.

A STUDY OF ANALYTIC MODELING TECHNIQUES FOR LANDING GEAR DYNAMICS Final Report, Nov. 1980 - Dec. 1981

Stephen M. Batill Wright-Patterson AFB, Ohio AFWAL May 1982 82 p refs
(Contract F33615-80-K-3242; AF Proj. 2307)
(AD-A122312; AFWAL-TR-82-3027) Avail: NTIS HC A05/MF A01 CSCL 01/3

The ability to accurately predict the dynamic response of an aircraft while it is operating in the taxi mode depends, in part on the correct modeling of the dynamic characteristics of the landing gear system. Traditionally, landing gear have been designed to absorb landing impact ('shock absorber') and their characteristics during periodic, oscillatory response ('spring') have been considered as secondary. With the increased emphasis on the rough or damaged field taxi operation, there is a requirement to determine the best methods for modeling the gear system. This report documents a brief review of the state of the art of gear modeling. A study was then conducted to evaluate important model parameters, using a simple cantilevered gear computer simulation. Also included is the development of a technique for the experimental determination of important gear system parameters. Author (GRA)

N83-19746# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Productivity, Reliability, Availability and Maintainability Program Office.

ANALYSIS OF UNITED STATES AIR FORCE AIRCRAFT ACCUMULATORS Final Report, Mar. - Apr. 1982

Francis E. Poast and Carmine Forzono Nov. 1982 89 p refs
(AD-A122092; ASD-TR-82-5030) Avail: NTIS HC A05/MF A01 CSCL 01/3

This report summarizes USAF aircraft hydraulic system accumulator installations and failure history. The purpose of this effort was to identify and select an appropriate installation for flight test of an improved accumulator of the metal bellows design. A test aircraft installation was identified. GRA

N83-19747# Vereinigte Flugtechnische Werke G.m.b.H., Bremen (West Germany).

AIRCRAFT DYNAMIC RESPONSE TO DAMAGED AND REPAIRED RUNWAYS

Klaus Koenig Nov. 1982 17 p refs AGARD/SMP Sub-Committee Meeting Held in Cologne, 1979, Cesme, Turkey, 1981, and Brussels, 1982 Sponsored by AGARD
(AGARD-AR-198; ISBN-92-835-1441-6) Avail: NTIS HC A02/MF A01

The capability of aircraft to operate on uneven runways was investigated. It was, however, found difficult to establish realistic unevenness data. Nevertheless, it is important and urgent to elaborate and agree on international ground-worthiness requirements. GRA

N83-20184# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Div. Avions.

IMPACT OF ERGONOMIC STUDIES ON THE DESIGN OF CIVIL AIRCRAFT COCKPITS [IMPACT DES ETUDES ERGONOMIQUES SUR LA CONCEPTION D'UN POSTE DE PILOTAGE D'AVION CIVIL]

J. P. Laborie *In* ESA Reliability and Maintainability Sep. 1982 p 37-42 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20832*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

THE QUIET SHORT-HAUL RESEARCH AIRCRAFT

John A. Cochrane *In* American Planning Association Proc. of the Monterey Conf. on Planning for Rotorcraft and Commuter Air Transportation Feb. 1983 p 22-23 (For primary document see N83-20830 10-85)
Avail: NTIS HC A09/MF A01 CSCL 01C

N83-20833*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

THE TILT ROTOR RESEARCH AIRCRAFT (XV-15) PROGRAM

John P. Magee *In* American Planning Association Proc. of the Monterey Conf. on Planning for Rotorcraft and Commuter Air Transportation Feb. 1983 p 24-33 (For primary document see N83-20830 10-85)
Avail: NTIS HC A09/MF A01 CSCL 01C

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N83-19748*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SIMULATOR STUDY OF A FLIGHT DIRECTOR DISPLAY
James J. Adams Mar. 1983 27 p refs
(NASA-TM-84581; L-15546; NAS 1.15:84581) Avail: NTIS HC A03/MF A01 CSCL 01D

A six degree of freedom, fixed base simulation study of the use of a flight director by general aviation pilots in an instrument landing system approach was conducted. An autopilot command law was used to drive the flight director needles. Time histories of the pilot aircraft display system responses and standard deviations and means of the glide slope and localizer errors were obtained. The pilot aircraft display system responses with the flight director were very similar to the autopilot aircraft responses. Without the flight director, the pilot aircraft display system exhibited less damping than with the flight director. The sensitivity of the flight director command laws was judged to be about as high as it could be by the test subjects. Thus, further improvement in the pilot aircraft display system performance by increasing the gains in the command laws was precluded. S.L.

N83-19749# Boeing Military Airplane Development, Seattle, Wash.
ADVANCED AVIONIC SYSTEMS FOR MULTIMISSION APPLICATIONS, VOLUME 1 Final Report, Jan. 1978 - Jun. 1980
Leroy A. Smith, W. Al Crossgrove, Donald E. Dewey, Richard F. Bousley, and Tammy R. Cremeen Wright-Patterson AFB, Ohio AFWAL Oct. 1982 54 p Presented at the NOACON Conf., 1980 3 Vol.
(Contract F33615-77-C-1252; AF Proj. 2003)
(AD-A121793; AFWAL-TR-82-1076-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 09/2

This study specifically addressed the role of microprocessors and LSI technology (five year forecast) in future avionic systems data bus, information transfer systems designs which allow future avionic systems additions, and the impact of Air Force standards on microprocessors. Cost models for hardware and software and information transfer system simulation models were also reviewed for possible use in the analysis of these systems. The study has resulted in the definition and analysis of three data bus information transfer systems which allow multimission applications. These information transfer systems are called stationary master, nonstationary master and contention multiple access. Author (GRA)

N83-19750# Boeing Military Airplane Development, Seattle, Wash.
ADVANCED AVIONIC SYSTEMS FOR MULTIMISSION APPLICATIONS, VOLUME 2 Final Report, May 1979 - Jun. 1980
Leroy A. Smith, Stephen W. Behnen, Keith D. Pratt, Mack B. McCall, and Richard F. Bousley Wright-Patterson AFB, Ohio AFWAL Oct. 1982 88 p 3 Vol.
(Contract F33615-77-C-1252; AF Proj. 2003)
(AD-A121794; AFWAL-TR-82-1076-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 09/2

This study produced system control procedures and executive software design specifications for three different information transfer systems (ITS), each designed to implement multimission aspects of an avionic system. The stationary master is the best understood ITS and has multimission advantages if the applications software is designed for change. The non-stationary master is an excellent candidate for a pod-oriented multimission application. The contention access ITS is designed to be most flexible in terms of change, at the potential cost of higher initial integration checkout due to the asynchronous nature of the communication. A second task was to design, develop and build a compact version of the DAIS executive that would function in a one processor system and support only synchronous bus communications. This executive, called the Single Processor Synchronous Executive (SPSE), was tested and delivered to AFWAL. The primary goals of this task were to build a functional executive that: Maintains the DAIS executive-to-applications interface; Communicates on a MIL-STD-1553A bus; Is coded in J73/I; Supports the avionic system load for an AMST or modern tactical fighter aircraft; Uses DAIS support software (LINKS, ALAP, PALEFAC, PALEFAC processor); and Requires substantially less memory than the baseline DAIS executive. All goals were achieved. Author (GRA)

N83-19751# Boeing Military Airplane Development, Seattle, Wash.
ADVANCED AVIONIC SYSTEMS FOR MULTIMISSION APPLICATIONS, VOLUME 3 Final Report, Jul. 1980 - Jun. 1981
Stephen W. Behnen and Keith D. Pratt Wright-Patterson AFB, Ohio AFWAL Oct. 1982 24 p 3 Vol.
(Contract F33615-77-C-1252; AF Proj. 2003)
(AD-A121795; AFWAL-TR-82-1076-Vol-3) Avail: NTIS HC A02/MF A01 CSCL 09/2

This technical report summarizes the update of the Single Processor Synchronous Executive (SPSE) to MIL-STD-1553B, MIL-STD-1750, and MIL-STD-1589B. This update was conducted as a follow-on to the original SPSE task performed for the AASMMA program. Author (GRA)

N83-19752# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
APPLICATION OF VIDEO MULTIPLEXING TO DESIGN OF COCKPIT DISPLAY SYSTEMS Final Report
Frank Uphoff 24 Mar. 1982 13 p
(AD-A122127; NADC-82089-60) Avail: NTIS HC A02/MF A01 CSCL 01/3

Video multiplexing plays an important role in the success of the Advanced Integrated Display Program because it facilitates the use of cathode-ray tube displays in the cockpit with extreme simplicity, high reliability, economy of space and weight, unusual flexibility of operation, and easy adaptability to different arrays of aircraft sensors. This report describes and explains the NADC laboratory demonstration of the wide-band frequency-division video multiplex system. Author (GRA)

N83-20196# Societe Crouzet, Valence (France). Div. Aerospatiale.
A FUNCTIONALLY RELIABLE AVIONICS SYSTEMS [SYSTEME AVIONIQUE SUR DE FONCTIONNEMENT]
A. Demoment, J. P. Stefanini, and N. Travaillard *In* ESA Reliability and Maintainability Sep. 1982 p 127-134 refs In FRENCH Sponsored in part by STTE (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20697# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
CRITICAL RESEARCH ISSUES ON COCKPIT APPLICATIONS OF 3-D DISPLAYS
Kenneth R. Boff *In* NAS-NRC Three-Dimensional Displays 1982 p 129-138 refs (For primary document see N83-20692 10-70)
Avail: NTIS HC A09/MF A01 CSCL 01/4

N83-20701# Naval Air Development Center, Warminster, Pa.
THE APPLICABILITY OF 3D DISPLAY RESEARCH TO MILITARY OPERATIONAL NEEDS
James H. Brindle *In* NAS-NRC Three-Dimensional Displays 1982 p 157-170 (For primary document see N83-20692 10-70)
Avail: NTIS HC A09/MF A01 CSCL 01/4

N83-20702# Federal Aviation Administration, Washington, D.C. Airborne Systems Branch.
APPLICABILITY OF 3D DISPLAY RESEARCH TO OPERATIONAL NEEDS
Roger P. Neeland *In* NAS-NRC Three-Dimensional Displays 1982 p 171-176 (For primary document see N83-20692 10-70)
Avail: NTIS HC A09/MF A01 CSCL 01/4

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N83-19753*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.

ENERGY EFFICIENT ENGINE SECTOR COMBUSTOR RIG TEST PROGRAM

D. J. Dubiel, W. Greene, C. V. Sundt, S. Tanrikut, and M. H. Zeisser Oct. 1981 160 p refs

(Contract NAS3-20646)

(NASA-CR-167913; NAS 1.26:167913; PWA-5594-180) Avail: NTIS HC A08/MF A01 CSCL 21E

Under the NASA-sponsored Energy Efficient Engine program, Pratt & Whitney Aircraft has successfully completed a comprehensive combustor rig test using a 90-degree sector of an advanced two-stage combustor with a segmented liner. Initial testing utilized a combustor with a conventional louvered liner and demonstrated that the Energy Efficient Engine two-stage combustor configuration is a viable system for controlling exhaust emissions, with the capability to meet all aerothermal performance goals. Goals for both carbon monoxide and unburned hydrocarbons were surpassed and the goal for oxides of nitrogen was closely approached. In another series of tests, an advanced segmented liner configuration with a unique counter-parallel FINWALL cooling system was evaluated at engine sea level takeoff pressure and temperature levels. These tests verified the structural integrity of this liner design. Overall, the results from the program have provided a high level of confidence to proceed with the scheduled Combustor Component Rig Test Program. Author

N83-19754*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TONE GENERATION BY ROTOR-DOWNSTREAM STRUT INTERACTION

Richard P. Woodward and Joseph R. Balombin 1983 17 p refs Proposed for presentation at the 8th Aeroacoustics Conf., Atlanta, 11-13 Apr. 1983; sponsored by the American Inst. of Aeronautics and Astronautics

(NASA-TM-83330; E-1577; NAS 1.15:83330) Avail: NTIS HC A02/MF A01 CSCL 21E

A JT15D fan stage was acoustically tested in the NASA Lewis anechoic chamber as part of the joint Lewis-Langley Research Center investigation of flight simulation techniques and flight effects using the JT15D engine as a common test vehicle. Suspected rotor-downstream support strut interaction was confirmed through the use of simulated support struts which were tested at three axial rotor-strut spacings. Tests were also performed with the struts removed. Inlet boundary layer suction in conjuction with an inflow control device was also explored. The removal of the boundary layer reduced the fan fundamental tone levels suggesting that the mounting and mating of such a device to the nacelle requires careful attention. With the same inflow control device installed good acoustic agreement was shown between the engine on an outdoor test stand and the fan in the anechoic chamber. Author

N83-19755*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

ENTRAINMENT AND MIXING IN THRUST AUGMENTING EJECTORS

L. Bernal and V. Sarohia 26 Feb. 1982 89 p refs

(Contracts NAS7-100; MIRP-FY1456-80-00005; N62269-80-MP-00034; AFOSR-ISSA-81-00029; AF Proj. 2307)

(NASA-CR-170027; NAS 1.26:170027; AD-A121637; AFOSR-82-1008TR) Avail: NTIS HC A05/MF A01 CSCL 21/5

Experiments were performed with a subsonic and underexpanded choked two dimensional primary nozzle ejector flow system without diffusion to evaluate the role of entrainment and mixing in thrust augmentation. Two component laser Doppler velocity measurements (mean and fluctuating values), thrust measurements, ejector shroud surface pressure measurements and flow visualization were used to determine the evolution of the velocity profiles and their relationship to the ejector performance. The key findings of this research are: (1) primary jet growth is significantly altered by the ejector shroud; (2) primary jet turbulent characteristics when normalized with the local mean centerline velocity are in agreement with those for the free-jet; (3) in the neighborhood of the ejector shroud, the flow field can be classified into two regions, the potential flow region and the region close to the ejector exit which is dominated by the turbulent transport; and (4) the pressure recovery is very sharp in the first region and is more gradual in the region close to the ejector exit. GRA

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N83-19756*# Old Dominion Univ., Norfolk, Va. School of Mechanical Engineering and Mechanics.

FLUTTER: A FINITE ELEMENT PROGRAM FOR AERODYNAMIC INSTABILITY ANALYSIS OF GENERAL SHELLS OF REVOLUTION WITH THERMAL PRESTRESS Final Report, period ending 30 Sep. 1982

Dennis J. Fallon and Earl A. Thornton Mar. 1983 18 p refs

(Grant NsG-1167)

(NASA-CR-170013; NAS 1.26:170013) Avail: NTIS HC A02/MF A01 CSCL 01C

Documentation for the computer program FLUTTER is presented. The theory of aerodynamic instability with thermal prestress is discussed. Theoretical aspects of the finite element matrices required in the aerodynamic instability analysis are also discussed. General organization of the computer program is explained, and instructions are then presented for the execution of the program. S.L.

N83-19757*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

HIGH-ANGLE-OF-ATTACK STABILITY CHARACTERISTICS OF A 3-SURFACE FIGHTER CONFIGURATION

Sue B. Grafton, Mark A. Croom, and Luat T. Nguyen Mar. 1983 60 p refs

(NASA-TM-84584; L-15551; NAS 1.15:84584) Avail: NTIS HC A04/MF A01 CSCL 01C

A wind tunnel investigation was conducted to study the low speed, high angle of attack stability characteristics of a three surface fighter concept based on the F-15 configuration. Static force data were measured over angle of attack and side-slip ranges of 0 to 85 and -10 and 10 deg, respectively. A force oscillation technique was used to obtain dynamic derivatives at angles of attack from 0 to 60 deg. The tests were conducted for several canard deflections and with the canards removed to investigate the effects of the close coupled canard on the high angle of attack stability characteristics of the configuration. A fuselage strake was developed which significantly improved static lateral directional stability characteristics at high angles of attack while also increasing the maximum lift of the configuration. Author

N83-19758*# George Washington Univ., Hampton, Va.

DETERMINATION OF AIRPLANE MODEL STRUCTURE FROM FLIGHT DATA USING SPLINES AND STEPWISE REGRESSION

Vladislav Klein (George Washington Univ., Hampton, Va.) and James G. Batterson Mar. 1983 52 p refs

(NASA-TP-2126; L-15541; NAS 1.60:2126) Avail: NTIS HC A04/MF A01 CSCL 01C

A procedure for the determination of airplane model structure from flight data is presented. The model is based on a polynomial spline representation of the aerodynamic coefficients, and the procedure is implemented by use of a stepwise regression. First, a form of the aerodynamic force and moment coefficients amenable to the utilization of splines is developed. Next, expressions for the splines in one and two variables are introduced. Then the steps in the determination of an aerodynamic model structure and the estimation of parameters are discussed briefly. The focus is on the application to flight data of the techniques developed. Author

N83-19759# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Flight Dynamics Lab.
DESIGN CRITERIA FOR THE FUTURE OF FLIGHT CONTROLS Interim Report, Mar. 1980 - Mar. 1982
Stanley G. Fuller, comp. and David W. Potts, comp. Jul. 1982 722 p Proc. of the Flight Dyn. Lab. Flying Qualities and Flight Control Symp., Dayton, Ohio, 2-5 Mar. 1982
(AF Proj. 2403)
(AD-A121423; AFWAL-TR-82-3064) Avail: NTIS HC A99/MF A01 CSCL 01/2

Proceedings are reported of a symposium held in Dayton, sponsored by the Flight Dynamics Laboratory during 2-5 March 1982. The symposium was planned and ran by the Flight Control Division, specifically the Flying Qualities Group and the Control Techniques Group as part of an ongoing effort to revise and upgrade both MIL-F-8785C, Military Specification, Flying Qualities of Piloted Airplanes, and MIL-F-9490D, Flight Control System-Design, Installation and Test of Piloted Aircraft, General Specification For. Specialists from both the flying qualities and flight control system disciplines were gathered in Dayton from both industry and government agencies. Formal and informal presentations, plus workshop discussions, were structured around proposed draft versions of the new Flying Qualities MIL-Standard and Handbook and the new Flight Control Systems MIL-Specification and Handbook. This report contains a record of the presentations and discussions as submitted by the individual authors. GRA

N83-19760# Aircraft Research and Development Unit, Edinburg (Australia). Aircraft Research and Development Unit.
EVALUATION OF IROQUOIS UH-1B STABILITY AND CONTROL
L. R. Ward Sep. 1982 57 p refs
(AD-A122302; ARDU-TI-783) Avail: NTIS HC A04/MF A01 CSCL 01/3

The purpose of this investigation was to evaluate the forward flying qualities of the Iroquois UH-1B helicopter for the Training and SAR missions as conducted by the Royal Australian Air Force. Several unsatisfactory handling characteristics were identified. Highly undesirable features included the rapidly divergent longitudinal long term response in maximum power climbs; excessive vibration levels; coupling of sideslip to pitching moments; excessive trim changes when transitioning from climb to descent; and non-linearities in the collective fixed static longitudinal stability gradients in maximum power climbs. Undesirable features included the level flight gust response; longitudinal control response in level flight; lateral-directional oscillation; and adverse yaw. Possible causes of the extremely divergent longitudinal long term response in high powered climbs and the sideslip-pitch coupling are discussed. GRA

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N83-19761*# Connecticut Univ., Storrs. Dept. of Mechanical Engineering.
TURBINE ENDWALL SINGLE CYLINDER PROGRAM Semiannual Status Report, 1 Jul. 1982 - 1 Jan. 1983
Lee S. Langston and Wayne A. Eckerle 18 Mar. 1983 43 p
(Grant NsG-3238)
(NASA-CR-170008; NAS 1.26:170008) Avail: NTIS HC A03/MF A01 CSCL 14B

Measurements of the flow field in front of a large-scale single cylinder, mounted in a wind tunnel are discussed. Static pressures on the endwall and cylinder surfaces, extensive five-hole probe pressures in front of and around the cylinder, and velocity fluctuations using a hot-wire probe where the flow is steady enough to yield meaningful results are included. Author

N83-19762# Illinois Univ., Urbana. Dept. of Civil Engineering.
LONGITUDINAL JOINT SYSTEMS IN SLIP-FORMED RIGID PAVEMENTS. VOLUME 5: SUMMARY OF FIELD TEST RESULTS FROM CHICAGO O'HARE INTERNATIONAL AIRPORT Final Report
Ernest J. Barenberg Feb. 1983 64 p refs
(Contract DOT-FH-11-84[illegible])
(FAA-RD-79-4-5; FR-5) Avail: NTIS HC A04/MF A01

A summary of test finding on the design and construction of longitudinal joints in slip-formed concrete pavements was presented. Tests performed include nondestructive tests performed with several types of vibrator and impulse loading devices, and loading with commercial aircraft. Pavement responses under the various loading conditions were measured using the geophones normally used with the NDT type equipment, and with deflection gages and strain meters installed in the pavement slabs. In these tests particular emphasis was placed on measuring the load transfer efficiency across transverse and longitudinal joints and the effect of load transfer efficiency on the behavior of the pavement system. Results from these tests clearly show the importance of load transfer on certain types of distress in concrete pavements, as loss of load transfer efficiency can lead directly to corner breaks and pavement faulting. B.G.

N83-19763# Aeronautical Research Labs., Melbourne (Australia).
AERODYNAMIC TEST FACILITY REQUIREMENTS FOR DEFENCE R AND D TO 2000 AND BEYOND
N. Pollock and M. L. Robinson Sep. 1982 43 p refs
(AD-A122096; ARL-GD-005; WSRL-0287-SD) Avail: NTIS HC A03/MF A01 CSCL 14/2

Existing Australian aerodynamic test facilities are reviewed with respect to their suitability to meet current and projected defense needs. The deficiencies of the existing facilities are identified and new facilities proposed. This document is a compilation of views of the authors and of senior staff engaged in the management and practice of aerodynamics at the Aeronautical Research Laboratories and the Weapons Systems Research Laboratory. GRA

N83-19764# Office of Technology Assessment, Washington, D.C.
REVIEW OF THE FAA 1982 NATIONAL AIRSPACE SYSTEM PLAN
Aug. 1982 74 p refs
(PB83-102772; OTA-STI-176; LC-82-600595) Avail: NTIS HC A04/MF A01 CSCL 01B

In January 1982, shortly after OTA had concluded an assessment of the airport and air traffic control system, the Federal Aviation Administration released the 1982 National Airspace System (NAS) Plan. The Transportation Subcommittee of the House Committee on Appropriations asked that OTA undertake a review of the NAS Plan, building on the results of the assessment that had been carried out at their request. OTA's approach to conducting this review was to examine the NAS Plan at two levels--the adequacy of the plan as a whole and the appropriateness of the specific technologies selected by FAA for implementation. Author (GRA)

N83-19779*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. TDA Engineering Office.
DSN TEST SUPPORT SYSTEM, MARK IV-85
B. W. Falin *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 128-134 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 14B

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N83-19765*# George Washington Univ., Washington, D.C. Graduate Program in Science, Technology, and Public Policy.
SPACE STATIONS: A POLICY HISTORY Final Report
John M. Logsdon Dec. 1982 80 p refs
(Contract NAS9-16461)
(NASA-CR-167801; NAS 1.26:167801) Avail: NTIS HC A05/MF A01 CSCL 22A

The space station concept was studied, and the program was defined. The project planning efforts are described. S.L.

N83-19766*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE TELECOMMUNICATIONS AND DATA AQUISITION REPORT Progress Report, Oct. - Dec. 1982
E. C. Posner, ed. 15 Feb. 1983 233 p refs
(NASA-CR-170071; JPL-TDA-PR-42-72; NAS 1.26:170071) Avail: NTIS HC A11/MF A01 CSCL 22A

Tracking and ground-based navigation techniques are discussed in relation to DSN advanced systems. Network data processing and productivity are studied to improve management planning methods. Project activities for upgrading DSN facilities are presented. For individual titles, see N83-19767 through N83-19786.

N83-19767*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Tracking Systems and Applications Section.
DESCRIPTION AND OVERVIEW OF AN INSTRUMENT DESIGNED TO MEASURE LINE-OF-SIGHT DELAY DUE TO WATER VAPOR **c35**
G. M. Resch, M. C. Chavez, and N. I. Yamane *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 1-19 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 14B

Eight dual channel microwave radiometers were constructed as a research and development effort for the Crustal Dynamics Project and the Deep Space Network. These instruments, known as water vapor radiometers, are primarily intended to demonstrate that the variable path delay imposed by atmospheric water vapor can be calibrated in microwave tracking and distance measuring systems but could also be used in other applications involving moist air meteorology and propagation studies. They are being deployed to various stations and observatories that participate in Very Long Baseline Interferometry experiments. The development history of these instruments are reviewed, the theory of operation and overall design considerations are outlined, and the instrumental parameters and performance characteristics are described. S.L.

N83-19768*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Radio Frequency and Microwave Subsystems Section.
VLBI COLLIMATION TOWER TECHNIQUE FOR TIME-DELAY STUDIES OF A LARGE GROUND STATION COMMUNICATIONS ANTENNA **c32**
T. Y. Otoshi, L. E. Young, and W. V. T. Rusch (Univ. of Southern California) *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 20-29 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 17B

A need for an accurate but inexpensive method for measuring and evaluating time delays of large ground antennas for VLBI applications motivated the development of the collimation tower technique. Supporting analytical work which was performed primarily to verify time delay measurement results obtained for a large antenna when the transmitter was at a collimation distance of 1/25 of the usual far field criterion is discussed. Comparisons of theoretical and experimental results are also given. S.L.

N83-19769*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Section.
A NEAR-OPTIMUM RECEIVER STRUCTURE FOR THE DETECTION OF M-ARY OPTICAL PPM SIGNALS **c32**
S. J. Dolinar, Jr. *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 30-42 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 17B

A class of receivers called conditionally nulling receivers is defined for quantum noise limited optical communications. These receivers have the ability to decide at each moment in time whether or not to coherently combine a predetermined local oscillator field with the received optical field, prior to performing an energy measurement (photodetection) on the combined field. Conditionally nulling receivers are applicable to pulse position modulation and related modulation schemes, which have the property that, at each moment in time, the transmitted signal is in one of only two states, on or off. The local oscillator field which may or may not be added by the receiver is an exact replica of the negative of the received on field; hence, the receiver can exactly null the on signal if the on signal is present and the receiver chooses to use the local field. An ideal conditionally nulling receiver achieves very nearly the same error probability (within a multiplicative factor varying froom 1 to 2.15) as the optimum quantum measurement for quantum noise limited detection of M-ary PPM signals. In contrast, other known receiving methods, such as direct, heterodyne, and homodyne detection, are exponentially suboptimum. S.L.

N83-19770*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Section.
CAPACITY AND CUTOFF RATE OF (M+1)-ARY DECISION RULES FOR NOISY M-ARY OPTICAL PPM CHANNEL **c74**
P. J. Lee *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 43-50 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 20F

The channel capacity C and the cutoff rate R sub o of two (M + 1)-ary decision rules for noisy M slots/symbol optical pulse position modulation (PPM) with ideal photon counting are computed and compared. Also the values of the optimum thresholds needed to minimize the signal requirements are given. With a minor increase in hardware complexity, the symbol by symbol threshold decision rule is shown to be superior to the slot by slot threshold detection and decision rule in two aspects: first, it saves more than 0.5 dB in signal energy for the very noisy cases of more than one noise photon per slot (for low noise cases it also saves signal energy, but a negligibly small amount). Second, it is more robust to variations in the noise level. S.L.

N83-19771*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Section.
AN UPDATE ON THE USE OF THE VLA FOR TELEMETRY RECEPTION **c17**
L. J. Deutsch *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 57-60 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 09F

An analysis is modified to incorporate the actual structure of the command signal system of the very large array (VLA). In particular, in addition to the 1-ms command signal there is a data invalid signal that is generated. The command signals are transmitted to the antennas during the period in which the data invalid signal is on. This means that the gaps in the received data are really 1.6 ms long rather than 1 ms long. Simulation

results with this taken into account show that the VLA will not support (7, 1/2) convolutionally encoded telemetry at acceptable error rates at any of the Voyager telemetry data rates. VLA will support Voyager encounters provided that either concatenated coding is implemented, VLA is arrayed with another receiving site (such as Goldstone), or VLA is reconfigured so that the gaps are rotated. S.L.

N83-19772*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Section.
A VLSI IMPLEMENTATION OF A MULTICODE CONVOLUTIONAL ENCODER c60
L. J. Deutsch *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 61-69 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 09B

A VLSI architecture and layout for a convolutional encoder is described. This architecture allows a single chip implementation of an encoder that is capable of handling many different convolutional codes including all the convolutional codes that are presently used for deep space missions. S.L.

N83-19773*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Deep Space Network Data Systems Section.
STAFFING IMPLICATIONS OF SOFTWARE PRODUCTIVITY MODELS c61
R. C. Tausworthe *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 70-77 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 09B

The attributes of software project staffing and productivity implied by equating the effects of two popular software models in a small neighborhood of a given effort-duration point are investigated. The first model presupposes that organizational productivity decreases as a function of the project staff size due to interfacing and intercommunication. The second, the so-called software equation, relates the product size to effort and duration through a power law tradeoff formula. The conclusions that may be reached by assuming that both of these describe project behavior, the former as a global phenomenon and the latter as a localized effect in a small neighborhood of a given effort duration point, are that (1) there is a calculable maximum effective staff level, which, if exceeded, reduces the project production rate, (2) there is a calculable maximum extent to which effort and time may be traded effectively, (3) it becomes ineffective in a practical sense to expend more than an additional 25 to 50% of resources in order to reduce delivery time, and (4) the team production efficiency can be computed directly from the staff level, the slope of the intercommunication loss function, and the ratio of exponents in the software equation. S.L.

N83-19774*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Telecommunication and Data Acquisition Section.
APPLICATIONS OF TELEMETRY ARRAYING IN THE DSN c17
R. Stevens *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 78-82 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 09F

The individual large antennas at a DSN complex were used in arrayed configurations to improve the telemetry return from very distant spacecraft. The technique was applied to support critical spacecraft events when good telemetry is most important. An expanded array configuration, will be provided to support the 1986 Voyager encounter with Uranus. The development and use of arraying by the DSN for spacecraft mission support is reviewed. Application of the experience to the 1986 design is discussed. S.L.

N83-19775*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. TDA Mission Support Office.
ANTENNA ARRAYING PERFORMANCE FOR DEEP SPACE TELECOMMUNICATIONS SYSTEMS c32
C. T. Stelzried, A. L. Berman, and G. K. Noreen *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 83-88 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 17B

Antenna arraying is a crucial Deep Space Network technique in maximizing the science return of planetary and comet encounters. The equations which describe the total figure of merit for a multiple system of arrayed antennas are developed. An example is given for three Canberra DSN antennas and the Parkes 64-m antenna to be arrayed for the Voyager 2 Uranus flyby. S.L.

N83-19776*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Atmospheric Sciences Section.
S-BAND APERTURE EFFICIENCY OF THE DSS 13 26-METER ANTENNA WITH THE S-X COMMON APERTURE FEED c32
M. J. Klein *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 89-94 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 17B

Measurements of the S-band performance of the DSS 13 26-meter antenna, equipped with the second generation S-X common aperture feed, are reported. Aperture efficiency and overall antenna gain results are compared with predicted values. The elevation dependence of the aperture efficiency is reported. S.L.

N83-19777*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Telecommunications Science and Engineering Div.
THE EFFECT OF PARTIAL COHERENCE IN RECEIVING SYSTEM NOISE TEMPERATURE ON ARRAY GAIN FOR TELEMETRY AND RADIO FREQUENCY CARRIER RECEPTION FOR RECEIVING SYSTEMS WITH UNEQUAL PREDETECTION SIGNAL-TO-NOISE RATIOS c17
M. H. Brockman *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 95-117 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 09F

Signal to noise ratio improvement realized by arraying receiving systems or stations for coherent reception is reduced when some portion of the predetection noise is coherent in the array. This effect for arrayed receiving systems with unequal apertures including expected performance for selected planets of the solar system within the array beamwidth is examined. S.L.

N83-19778*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Operations Sustaining Engineering Section.
A TWO-YEAR HISTORY OF ATOMIC FREQUENCY STANDARDS SYNTONIZATION IN THE DEEP SPACE NETWORK c70
S. C. Ward *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 118-127 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 14B

The frequency and timing system (FTS) of the Deep Space Network (DSN) consists of a collection of three sets of clocks driven by independent atomic oscillators. The synchronization of the output frequencies (syntonization) of these ocillators (reference frequency standards) is reported. There is an implied specification of a + or - 5.5 X 10 to the 12th power related to the DSN time synchronization specification of a + or - 100 microseconds. Both the syntonization within the three sets and the syntonization of the sets to the international standard (International Atomic Time) are considered. S.L.

N83-19779*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. TDA Engineering Office.
DSN TEST SUPPORT SYSTEM, MARK IV-85 c09
B. W. Falin *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 128-134 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 14B

As part of the network consolidation program, DSN test and training system, Mark III-77, will be upgraded during the Mark IVA implementation. This upgraded system is referred to as the DSN test support system, Mark IV-85. Descriptions and functional

capabilities that exist or will be implemented in the subsystems which comprise the DSN test support system are provided. S.L.

N83-19780*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Systems Engineering Section.
AN OVERVIEW OF THE GOLDSTONE ENERGY SYSTEMS STUDY **c44**
L. S. Rosenberg *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 135-141 (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 10B

A systems planning methodology was developed for analyzing and synthesizing Deep Space Network (DSN) energy systems. The resultant product, the Deep Space Network Planning and Analysis Methodology supports DSN energy planning evaluations. It addresses a broad spectrum of tradeoff and dispatching scenarios. It evaluates a variety of energy generation configurations and also includes a capability to evaluate conservation measures. S.L.

N83-19781*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. DSN Engineering Office.
PERFORMANCE SIMULATION OF THE JPL SOLAR-POWERED DISTILLER. PART 1: QUASI-STEADY-STATE CONDITIONS **c44**
C. S. Yung and F. L. Lansing *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 142-160 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 10A

A 37.85 cu m (10,000 gallons) per year (nominal) passive solar powered water distillation system was installed and is operational in the Venus Deep Space Station. The system replaced an old, electrically powered water distiller. The distilled water produced with its high electrical resistivity is used to cool the sensitive microwave equipment. A detailed thermal model was developed to simulate the performance of the distiller and study its sensitivity under varying environment and load conditions. The quasi-steady state portion of the model is presented together with the formulas for heat and mass transfer coefficients used. Initial results indicated that a daily water evaporation efficiency of 30% can be achieved. A comparison made between a full day performance simulation and the actual field measurements gave good agreement between theory and experiment, which verified the model. S.L.

N83-19782*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. DSN Engineering Section.
EFFICIENT COMPUTERIZED MODEL FOR DYNAMIC ANALYSIS OF ENERGY CONVERSION SYSTEMS **c44**
R. D. Hughes, F. L. Lansing, and I. R. Khan *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 161-176 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 10A

In searching for the optimum parameters that minimize the total life cycle cost of an energy conversion system, various combinations of components are examined and the resulting system performance and associated economics are studied. The systems performance and economics simulation computer program (SPECS) was developed to fill this need. The program simulates the fluid flow, thermal, and electrical characteristics of a system of components on a quasi-steady state basis for a variety of energy conversion systems. A unique approach is used in which the set of characteristic equations is solved by the Newton-Raphson technique. This approach eliminates the tedious iterative loops which are found in comparable programs such as TRNSYS or SOLTES-1. Several efficient features were also incorporated such as the centralized control and energy management scheme, and analogous treatment of energy flow in electrical and mechanical components, and the modeling of components of similar fundamental characteristics using generic subroutines. Initial tests indicate that this model can be used effectively with a relatively small number of time steps and low computer cost. S.L.

N83-19783*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Control Center.
THE MEASUREMENT OF OPERATOR WORKLOAD IN THE MARK IVA DSCC MONITOR AND CONTROL SUBSYSTEM **c54**
M. LeMay (Monclair State Coll.), R. L. Chafin, and E. E. Hird *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 177-185 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 05H

An operator workload measurement methodology is presented which will be used in support of the Mark IVA operational test and evaluation plan. Three operator workload measures are suggested: operator ratings, primary task work measures, and information processing time measures. A method of validating the workload measures using secondary task work measures is presented. It is expected that operations testing using these measures will assist in establishing the time required to perform essential operational activities and will indicate high risk operations areas due to potential operator overload. S.L.

N83-19784*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. TDA Mission Support Office.
THE 1986 LAUNCH OF THE GALILEO SPACECRAFT VIA THE SPACE TRANSPORTATION SYSTEM **c15**
A. L. Berman, D. J. Mudgway, and J. C. McKinney *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 186-199 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 22A

Beginning with the Galileo spacecraft launch, deep space payloads will be launched via the Space Shuttle. This change from the previous use of expendable launch vehicles will introduce large changes in procedures and data flow configurations for both the flight project and the Deep Space Network during the launch period. The planned Galileo launch period sequence of events and telemetry and command data flow configurations are described. S.L.

N83-19785*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. TDA Engineering Section.
DSN GROUND COMMUNICATIONS FACILITY **c32**
R. H. Evans *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 200-209 (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 17B

A functional description of the GCF and its relationships with other elements of the DSN and NASCOM is presented together with development objectives and goals and comments on implementation activites in support of flight projects. Author (IAA)

N83-19786*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Tracking Systems and Applications Section.
MV-3 COMMUNICATION SUBSYSTEM **c32**
G. S. Parks, R. S. Markham, T. J. Rowden, and M. L. MacMedan *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 210-219 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 17B

The operational mobile VLBI data acquisition system (MV-3) requires that a voice link be established between the mobile data system and a fixed site. A communications subsystem was incorporated in the MV-3 design which consists of HF radio, VHF mobile radio telephone and conventional land line telephone. The HF antenna design was optimized for short and long range transmission using both inverted V and yagi antennas mounted on a self-supporting telescoping mast. S.L.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

No abstracts in this category.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N83-19787# National Range Operations Directorate, White Sands Missile Range, N. Mex. Mathematical Services Branch.
ROBUST RANGE MEASUREMENT PREPROCESSING
William S. Agee and Robert H. Turner Oct. 1982 28 p refs
(AD-A121463; TR-83) Avail: NTIS HC A03/MF A01 CSCL 12/1

The RMS/MTTS instrumentation system located at MacGregor Range is a range measuring, multiple target tracking system. In order to obtain a vehicle trajectory from this system, the range measurement from several receivers are processed by least squares. Since the measured vehicle trajectories are often low altitude, the resulting nonlinear least squares equations are ill-conditioned. In addition, this measurement system is plagued by outliers, sometimes by dense burst of outliers. The combination of ill-conditioning and outliers is lethal and attempts to robustify the nonlinear least squares processing have failed. An alternative is to preprocess each of the range measurement sequences, eliminating the outliers and replacing them if necessary. Each sequence of range measurements is preprocessed by robustly fitting a cubic spline using iteratively reweighted least squares. Due to the nature of spline fitting and the possible dense bursts of outliers, the choice of a good set of initial weights for use in the iteratively reweighted least squares is important to the efficiency of the method. These initial weights are determined using robust, local fitting techniques. Several robust techniques have been tested for this local fitting application. The robust spline preprocessing is illustrated with some especially troublesome data sequences and the relative performance of several robust methods for choosing the initial weights is compared. GRA

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N83-19788*# Computational Mechanics Services, Austin, Tex.
NUMERICAL METHODS FOR GROUND SIMULATION OF SATELLITE MOTION Final Report
Dale G. Bettis [1982] 4 p refs
(Contract NAS9-16546)
(NASA-CR-167826; NAS 1.26:167826) Avail: NTIS HC A02/MF A01 CSCL 22A

Environmental models applicable for purposes of mission analysis were developed, documented, and recommended. The findings are described. Author

N83-19789 Royal Aircraft Establishment, Farnborough (England).
ON THE GENERATION OF SATELLITE POSITION (AND VELOCITY) BY A MIXED ANALYTICAL-NUMERICAL PROCEDURE
R. H. Gooding Sep. 1982 15 p refs
(BR85318; RAE-TM-Space-311) Copyright. Avail: Issuing Activity

The generation of accurate Earth satellite ephemerides by numerical integration, over a period of perhaps weeks, can consume an inordinate amount of computer time. No satisfactory purely analytical procedure exists, but if short period components of the standard elliptic elements are removed analytically, the resulting mean elements are integrated with a step time that is longer than the satellite's orbital period. The definition of the mean elements depends on the particular perturbations included in the orbit generator and regarded as nonresonant. It is best if short period perturbations are not applied to the orbital elements themselves but to the satellite's position (and velocity if required), expressed in a special system of polar coordinates (cylindrical or spherical), and the paper shows how mean elements were recovered from position and velocity. A computer program was written to test the proposed procedure for generating ephemerides, using a truncated potential field. Author

N83-19790# National Aerospace Lab., Kakuda (Japan).
ZONAL HARMONIC PERTURBATIONS IN THE MOTION OF AN ARTIFICIAL EARTH SATELLITE: THE FIRST AND SECOND ORDER PERTURBATIONS
Sumio Takeuchi 1982 20 p refs In JAPANESE; ENGLISH summary
(NAL-TR-738; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The use of canonical variables and von Zeipel's method in solving the problem of artificial satellite theory without air drag was studied by Brouwer. The equations of motion in the Lagrangean form have been investigated by Kozai in accordance with Brouwer's theory. In the present paper the theoretical explanations of the equations of motion derived by Kozai are shown in more detail. The equations are applied to the study of perturbative effects of Earth oblateness on the motion of an artificial satellite around the Earth. With the aid of eccentricity functions and inclination functions, the spherical harmonic disturbing function is converted to the function of Keplerian elements. By the method of linear perturbations the first and the second order perturbations are determined. The perturbations include coupling effects dependent on the Earth's oblateness and other actions upon the satellite. Author

N83-19791# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
PERSHING 2 SIMULATION STUDIES Final Report, 3 Feb. - 28 May 1982
J. D. Knight, R. L. Lynch, D. A. Pyles, R. N. Seitz, and T. V. Thornton Redstone Arsenal, Ala. Army Missile Command Jul. 1982 102 p refs
(Contract DAAH01-81-D-A003)
(AD-A121622; AD-E950311; DRSMI/RD-CR-82-27; GIT/EES-A-3165-FR) Avail: NTIS HC A06/MF A01 CSCL 09/2

Pershing 2 flight simulations were performed using the U70 missile simulation program to determine (1) in the event of an accidental nozzle deflection, how fast the missile would leave its (safe) flight corridor; (2) how well the U70 aerodynamic simulation matches the actual flight data; and (3) the trajectory profiles for nine Tactical Ballistic Missile flight trajectories. Also an advanced simulation program developed by TRW, Inc. was partially converted to run on an inhouse computer. Author (GRA)

N83-19792# University Coll., London (England). Lab. for Space Sciences.
ENERGETIC ELECTRON DETECTORS FOR THE METEOSAT SATELLITE: TECHNICAL SUPPORT Final Report, Feb. 1980 - Mar. 1982
A. D. Johnstone and G. L. Wrenn 9 Jul. 1982 19 p refs Sponsored in part by the European Office of Aerospace Research and Development
(Grant AF-AFOSR-0124-80; AF Proj. 2311)
(AD-A121459; MSSL-G827-01; AFGL-TR-82-0315) Avail: NTIS HC A02/MF A01 CSCL 22/2

The report describes the work undertaken to support the implementation of energetic electron detectors on the METEOSAT 2 satellite. A brief outline of the type of data and results being produced is also included. The project has been very successful and all the objectives have been achieved. Author (GRA)

N83-19793# Integrated Systems, Inc., Palo Alto, Calif.
MODERN CONTROL THEORY FOR ARMY MISSILE GUIDANCE Final Report, 21 Sep. 1981 - 20 Jun. 1982
R. H. Travassos, H. LevAri, and N. K. Gupta Nov. 1982 80 p refs

(Contract DAAG29-81-C-0039)
(AD-A121899; ISI-21; ARO-18319.1-MA-S) Avail: NTIS HC A05/MF A01 CSCL 16/4

A Singular perturbation guidance law has been developed for medium-range surface-to-air missiles. This guidance law is a significant extension of a previously developed guidance law for short-range missiles; in medium-range intercepts, the problem of energy management should be addressed in addition to homing guidance. The mathematical formulation has been simplified by introducing separation of time scales. Target Trajectory Estimation: A recursive algorithm for estimation of autoregressive moving average (ARMA) model parameters from noisy samples has been developed. Application of this algorithm to parameter estimation problems has exhibited its fast convergence and unbiasedness in the presence of noise, even with short data records. The algorithm has two versions, a Recursive Maximum Likelihood (RML) form and a Recursive Prediction Error (RPE) form, both of which possess a parallel structure that makes them highly suitable for parallel-processing implementation. Adaptive autopilots: Lattice-form algorithms have been developed for fast, recursive identification and control of time-varying systems. These algorithms have excellent numerical properties and a modular structure that makes them suitable for on-board real-time implementation.

Author (GRA)

N83-19794# National Defense Univ., Washington, D. C. Research Directorate.
THE US SPACE SYSTEM SURVIVABILITY. STRATEGIC ALTERNATIVES FOR THE 1990S
Robert B. Giffen 1982 79 p refs
(AD-A121957; National-Sec-Affairs-Mono-82-4) Avail: NTIS HC A05/MF A01 CSCL 22/2

This monograph proposes a systematic way to reduce the vulnerability of our critical space assets. The focus is on space systems vital to the national defense, and on the survivability of these systems across the spectrum of conflict. There is a gap between popular journalism and complex technical documentation, this monograph is written to help interested but inexpert readers understand how we can defeat and, conversely, how we can protect military space systems. GRA

N83-19795# M/A-COM LINKABIT, Inc., San Diego, Calif.
EARTH STATION INTERFACE FOR DEMAND ASSIGNMENT APPLICATIONS Quarterly Technical Report, 1 Jul. - 30 Sep. 1982
John E. McCormick 30 Sep. 1982 34 p
(Contract MDA903-81-C-0638; ARPA Order 3674)
(AD-A121797) Avail: NTIS HC A03/MF A01 CSCL 22/2

The ESI interface with a message processor for Bolt Beranek and Newman called the PSAT. M/A COM LINKABIT does not have a PSAT, but design verification testing must be performed in order to ensure the enhancements performed under this contract meet the requirements set forth in the proposal. In addition, each of the six ESI's produced will require the performance of an Acceptance Test Procedure prior to shipment. M/A-COM LINKABIT has proposed the design and construction of a PSAT Emulator which could exercise the ESI in a manner which approximates the PSAT well enough to verify operational status. The PSAT Emulator is designed around a Hewlett Packard 9836 desktop computer, whose principal means of communication with the ESI will be through an Emulator Interface Circuit Card Assembly (CCA). The design of the Emulator CCA is a substantial task and is now underway. This Technical Report discusses the design requirements for that CCA and will, we hope, impart some overall understanding of the PSAT Emulator. It should also be noted that BB&N is producing a new message processor, the BSAT, which streamlines message handling protocols for improved channel throughput. GRA

N83-19796# Raytheon Co., Huntsville, Ala. Life Cycle Analysis Group.
STORAGE RELIABILITY ANALYSIS SUMMARY REPORT. VOLUME 3. HYDRAULIC AND PNEUMATIC DEVICES Final Report, Sep. 1980 - Sep. 1982
Harold B. Smith, Jr. and Irvin L. Krulac Sep. 1982 114 p refs 4 Vol.
(Contract DAAH01-80-D-0020; DA Proj. 1W3-63313-D-087)
(AD-A122194; AD-E950318; LC-82-2-Vol-3) Avail: NTIS HC A06/MF A01 CSCL 13/7

This document summarizes storage reliability data collected by US Army Missile Command on hydraulic and pneumatic devices over a period of several years. Sources of data are detailed, major failure modes and mechanisms are listed and discussed. Non-operational failure rate prediction methodology is given, and conclusions and recommendations for enhancing the storage reliability of devices are drawn from the analysis of the collected data. Author (GRA)

N83-19784*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. TDA Mission Support Office.
THE 1986 LAUNCH OF THE GALILEO SPACECRAFT VIA THE SPACE TRANSPORTATION SYSTEM
A. L. Berman, D. J. Mudgway, and J. C. McKinney *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 186-199 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 22A

N83-20254# Indian Space Research Organization, Ahmedabad.
QUALIFICATION AND SCREENING OF ELECTROMECHANICAL SHUTTERS USED ONBOARD SATELLITES FOR EARTH OBSERVATIONS
S. R. Naik, V. K. Manglik, P. L. Kulkarni, B. G. V. Subramanyam, A. S. KiranKumar, and B. V. Aradhye *In* ESA Reliability and Maintainability Sep. 1982 p 545-552 (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N83-19797*# Boeing Aerospace Co., Seattle, Wash.
SHUTTLE DERIVED VEHICLE ANALYSIS SOLID BOOSTER UNMANNED LAUNCH VEHICLE CONCEPT DEFINITION STUDY, VOLUME 2 Final Report
Feb. 1983 286 p refs
(Contract NAS8-34722)
(NASA-CR-161979; NAS 1.26:161979; D180-27351-2-Vol-2) Avail: NTIS HC A13/MF A01 CSCL 22B

The technical effort associated with the selection and definition of the recommended SRB-X concept is documented. Included are discussions concerning the trades leading to the selected concept, the analysis that established the concept's basic subsystem characteristics, selected configuration description and performance capabilities, launch site operations and facility needs, development schedule, cost characteristics, risk assessment, and a cursory comparison with other launch systems. Author

N83-19798# General Accounting Office, Washington, D. C.
ISSUES CONCERNING THE FUTURE OPERATION OF THE SPACE OPERATION OF THE SPACE TRANSPORTATION SYSTEM
28 Dec. 1982 34 p refs
(GAO/MASAD-83-6) Avail: NTIS HC A03/MF A01

Logistics support, launch and mission control operations, astronaut recruitment and training, cost accounting, launch and landing facilities, launch vehicles, and STS design goals are discussed. Author

N83-19799*# Rockwell International Corp., Los Angeles, Calif. Space Operations and Satellite Systems Div.
SPACE OPERATIONS CENTER: SHUTTLE INTERACTION

STUDY Final Report
1 Apr. 1981 123 p
(Contract NAS9-16153)
(NASA-CR-167822; NAS 1.26:167822; PD-81-7) Avail: NTIS HC A06/MF A01 CSCL 22A

Orbital altitude, berthing and docking, Space Operation Center (SOC), SOC resupply and fuel transfer review, and flight support facility are reviewed. Author

N83-19800*# Teledyne Brown Engineering, Huntsville, Ala. Payload Missions Integration Div.
PAYLOAD MISSIONS INTEGRATION Progress Report, 16 Nov. 1982 - 15 Jan. 1983
28 Jan. 1983 41 p refs
(Contract NAS8-32712)
(NASA-CR-170725; NAS 1.26:170725; DR-MA-03) Avail: NTIS HC A03/MF A01 CSCL 22B

Payload mission integration is summarized. Activities and achievements for Spacelab OSTA and OSS are discussed. S.L.

N83-19801*# Rockwell International Corp., Los Angeles, Calif. Space Operations and Satellite Systems Div.
SPACE OPERATIONS CENTER: SHUTTLE INTERACTION STUDY Final Report
17 Apr. 1981 71 p
(Contract NAS9-16153)
(NASA-CR-167823; NAS 1.26:167823; SSD-81-0076) Avail: NTIS HC A04/MF A01 CSCL 22A

The implication of using the Shuttle with the Space Operation Center (SOC), including constraints that the Shuttle will place upon the SOC design. The study identifies the considerations involved in the use of the Shuttle as a part of the SOC concept, and also identifies the constraints to the SOC imposed by the Shuttle in its interactions with the SOC, and on the design or technical solutions which allow satisfactory accomplishment of the interactions. Author

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N83-19802# Range Commanders Council, White Sands Missile Range, N. Mex. Interrange Instrumentation Group.
TEST METHODS FOR TELEMETRY SYSTEMS AND SUBSYSTEMS. VOLUME 3: TEST METHODS FOR RECORDER/REPRODUCER SYSTEMS AND MAGNETIC TAPE Final Report, Sep. - Oct. 1982
Oct. 1982 141 p Revised
(AD-A121858; IRIG-118-79-Vol-3) Avail: NTIS HC A07/MF A01 CSCL 09/6

Test methods for telemetry systems and subsystems are given, as well as test methods for recorder/reproducer systems and magnetic tape. Guidance for consistency of test setup and evaluation of results is given. R.J.F.

N83-19803# Range Commanders Council, White Sands Missile Range, N. Mex. Telemetry Group.
TEST METHODS FOR TELEMETRY SYSTEMS AND SUBSYSTEMS. VOLUME 2. TEST METHODS FOR TELEMETRY RF SUBSYSTEMS Final Report, Sep. - Oct. 1982
Oct. 1982 182 p 3 Vol.
(AD-A121816; IRIG-118-79-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 09/6

Test procedures used to verify and/or evaluate the performance of the receiving antenna and the pedestal drive and control system are described. The maximum angular velocity and acceleration for any operational mode are determined. The performance parameters of telemetry RF amplifiers are measured. The range of linear operation is determined by measuring the intermodulation (IM) products, gain compression level, power gain, bandwidth, intercept point, 3rd order IM threshold, voltage standing, wave ratio, noise figure, and gain variation due to temperature and supply voltage. S.L.

N83-19804# Sandia Labs., Albuquerque, N. Mex.
TECHNICAL MANUAL DESCRIPTION AND OPERATING PROCEDURES: TELEMETRY MODULATION METER MODEL T79640
H. O. Jeske Apr. 1982 15 p refs
(Contract DE-AC04-76DP-00789)
(DE82-014616; SAND-81-1939) Avail: NTIS HC A02/MF A01

The physical and functional description and operating procedures for the T79640 Telemetry Modulation Meter are presented. This equipment permits the measurement of the deviation of telemetry transmitters by individual subcarrier channels. In addition, both the root-mean-square (RMS) and peak transmitter deviation levels produced by multiplexed modulation signals are displayed. DOE

N83-19771*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Section.
AN UPDATE ON THE USE OF THE VLA FOR TELEMETRY RECEPTION
L. J. Deutsch *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 57-60 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 09F

N83-19774*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Telecommunication and Data Acquisition Section.
APPLICATIONS OF TELEMETRY ARRAYING IN THE DSN
R. Stevens *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 78-82 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 09F

N83-19777*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Telecommunications Science and Engineering Div.
THE EFFECT OF PARTIAL COHERENCE IN RECEIVING SYSTEM NOISE TEMPERATURE ON ARRAY GAIN FOR TELEMETRY AND RADIO FREQUENCY CARRIER RECEPTION FOR RECEIVING SYSTEMS WITH UNEQUAL PREDETECTION SIGNAL-TO-NOISE RATIOS
M. H. Brockman *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 95-117 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 09F

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N83-19805*# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.
LARGE SPACE STRUCTURE DAMPING DESIGN Final Report, 16 Jan. 1981 - 15 Jan. 1983
Walter D. Pilkey and J. Kenneth Haviland 1983 127 p refs
(Grant NAG1-137)
(NASA-CR-170020; NAS 1.26:170020; UVA/528201/MAE83/101)
Avail: NTIS HC A07/MF A01 CSCL 22B

Several FORTRAN subroutines and programs were developed which compute complex eigenvalues of a damped system using different approaches, and which rescale mode shapes to unit

generalized mass and make rigid bodies orthogonal to each other. An analytical proof of a Minimum Constrained Frequency Criterion (MCFC) for a single damper is presented. A method to minimize the effect of control spill-over for large space structures is proposed. The characteristic equation of an undamped system with a generalized control law is derived using reanalysis theory. This equation can be implemented in computer programs for efficient eigenvalue analysis or control quasi synthesis. Methods to control vibrations in large space structure are reviewed and analyzed. The resulting prototype, using electromagnetic actuator, is described. Author

N83-19806*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A MOBILE WORK STATION CONCEPT FOR MECHANICALLY AIDED ASTRONAUT ASSEMBLY OF LARGE SPACE TRUSSES
Walter L. Heard, Jr., Harold G. Bush, Richard E. Wallson (Kentron International, Inc., Hampton, Va.), and J. Kermit Jensen (Kentron International, Inc., Hampton, Va.) Mar. 1983 36 p refs
(NASA-TP-2108; L-15523; NAS 1.60:2108) Avail: NTIS HC A03/MF A01 CSCL 22B

This report presents results of a series of truss assembly tests conducted to evaluate a mobile work station concept intended to mechanically assist astronaut manual assembly of erectable space trusses. The tests involved assembly of a tetrahedral truss beam by a pair of test subjects with and without pressure (space) suits, both in Earth gravity and in simulated zero gravity (neutral buoyancy in water). The beam was assembled from 38 identical graphite-epoxy nestable struts, 5.4 m in length with aluminum quick-attachment structural joints. Struts and joints were designed to closely simulate flight hardware. The assembled beam was approximately 16.5 m long and 4.5 m on each of the four sides of its diamond-shaped cross section. The results show that average in-space assembly rates of approximately 38 seconds per strut can be expected for struts of comparable size. This result is virtually independent of the overall size of the structure being assembled. The mobile work station concept would improve astronaut efficiency for on-orbit manual assembly of truss structures, and also this assembly-line method is highly competitive with other construction methods being considered for large space structures. Author

N83-19807*# Northwestern Univ., Evanston, Ill. Dept. of Mechanical and Nuclear Engineering.
MIXED TIME INTEGRATION METHODS FOR TRANSIENT THERMAL ANALYSIS OF STRUCTURES
Wing Kam Liu [1982] 8 p refs
(Grant NAG1-210)
(NASA-CR-170060; NAS 1.26:170060) Avail: NTIS HC A02/MF A01 CSCL 22B

The computational methods used to predict and optimize the thermal structural behavior of aerospace vehicle structures are reviewed. In general, two classes of algorithms, implicit and explicit, are used in transient thermal analysis of structures. Each of these two methods has its own merits. Due to the different time scales of the mechanical and thermal responses, the selection of a time integration method can be a different yet critical factor in the efficient solution of such problems. Therefore mixed time integration methods for transient thermal analysis of structures are being developed. The computer implementation aspects and numerical evaluation of these mixed time implicit-explicit algorithms in thermal analysis of structures are presented. A computationally useful method of estimating the critical time step for linear quadrilateral element is also given. Numerical tests confirm the stability criterion and accuracy characteristics of the methods. The superiority of these mixed time methods to the fully implicit method or the fully explicit method is also demonstrated. S.L.

N83-20260# Centre National d'Etudes Spatiales, Toulouse (France).
SELECTION AND DEVELOPMENT POLICY FOR COMPONENTS FOR SPACE USE [POLITIQUE DE CHOIX ET DE DEVELOPPEMENT DES COMPOSANTS POUR USAGE SPATIALE]
B. Cluzel *In* ESA Reliability and Maintainability Sep. 1982 p 585-587 In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N83-19808*# Calspan Field Services, Inc., Arnold Air Force Station, Tenn.
WIND TUNNEL TESTS OF SPACE SHUTTLE SOLID ROCKET BOOSTER INSULATION MATERIAL IN THE AEROTHERMAL TUNNEL C Final Report, 2 Sep. - 22 Sep. 1982
A. S. Hartman and K. W. Nutt AEDC Nov. 1982 54 p refs Sponsored by AF
(AEDC-TSR-82-V38) Avail: NTIS HC A04/MF A01 CSCL 21H

Wind tunnel tests of the space shuttle Solid Rocket Booster Insulation were conducted in the von Karman Gas Dynamics Facility Tunnel C. For these tests, Tunnel C was run at Mach 4 with a total temperature of 1100-1440 and a total pressure of 100 psia. Cold wall heating rates were changed by varying the test article support wedge angle. Selected results are presented to illustrate the test techniques and typical data obtained. Author

N83-19809*# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
ADVANCED ION THRUSTER AND ELECTROCHEMICAL LAUNCHER RESEARCH Annual Report, 1 Dec. 1981 - 1 Dec. 1982
Paul J. Wilbur Jan. 1983 144 p refs
(Grant NGR-06-002-112)
(NASA-CR-168083; NAS 1.26:168083) Avail: NTIS HC A07/MF A01 CSCL 21C

The theoretical model of orificed hollow cathode operation predicted experimentally observed cathode performance with reasonable accuracy. The deflection and divergence characteristics of ion beamlets emanating from a two grid optics system as a function of the relative offset of screen and accel grids hole axes were described. Ion currents associated with discharge chamber operation were controlled to improve ion thruster performance markedly. Limitations imposed by basic physical laws on reductions in screen grid hole size and grid spacing for ion optics systems were described. The influence of stray magnetic fields in the vicinity of a neutralizer on the performance of that neutralizer was demonstrated. The ion current density extracted from a thruster was enhanced by injecting electrons into the region between its ion accelerating grids. Theoretical analysis of the electrothermal ramjet concept of launching space bound payloads at high acceleration levels is described. The operation of this system is broken down into two phases. In the light gas gun phase the payload is accelerated to the velocity at which the ramjet phase can commence. Preliminary models of operation are examined and shown to yield overall energy efficiences for a typical Earth escape launch of 60 to 70%. When shock losses are incorporated

these efficiencies are still observed to remain at the relatively high values of 40 to 50%. B.G.

N83-19810# Raytheon Co., Huntsville, Ala. Life Cycle Analysis Group.
STORAGE RELIABILITY ANALYSIS SUMMARY REPORT. VOLUME 4: ORDNANCE DEVICES Final Report, Sep. 1980 - Sep. 1982
Harold B. Smith, Jr. and Irvin L. Krulac Sep. 1982 89 p refs
(Contract DAAH01-80-C-0020; DA Proj. 1W3-63313-D-087)
(AD-A122054; LC-82-2-Vol-4) Avail: NTIS HC A05/MF A01 CSCL 21/8

This document summarizes storage reliability data collected by the US Army Missile Command on ordnance devices over a period of several years. Sources of data are detailed, major failure modes and mechanisms are listed and discussed. Nonoperational failure rate prediction methodology is given, and conclusions and recommendations for enhancing the storage reliability of devices are drawn from the analysis of the data collected. Author (GRA)

N83-19811# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
DETECTION OF ROCKET FUEL COMPONENTS BY MULTIPHOTON PHOTOIONIZATION MASS SPECTROSCOPY
C. M. Klimcak 1 Oct. 1982 30 p refs
(Contract F04701-82-C-0083)
(AD-A120570; SD-TR-82-70; TR-0083(3945-11)-1) Avail: NTIS HC A03/MF A01 CSCL 07/4

The feasibility of detecting ultralow levels of some volatile components of propellant mixtures was experimentally investigated. High sensitivity with excellent selectivity of detection was projected by utilizing multiphoton photoionization in conjunction with mass spectral photofragment analysis. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N83-19812*# Arkansas State Univ., State University.
VAPORIZATION THERMODYNAMICS OF K2S AND K2SO3 Final Report
J. Edward Bennet Jun. 1982 65 p refs
(Grant NsG-3249; Contract DE-AI01-77ET-10769)
(NASA-CR-168080; DOE/NASA/3249-1; NAS 1.26:168080) Avail: NTIS HC A04/MF A01 CSCL 20M

The vaporization reactions, vapor pressures, and thermodynamics of potassium sulfide and potassium sulfite were studied for purposes of providing fundamental data for the seed cycle in magnetohydrodynamic electric power generation. Rate of effusion studies, supported by tube furnace experiments, X-ray powder diffraction, mass spectrometry and appropriate chemical analyses and tests, revealed that potassium sulfite disproportionates at high temperatures to form potassium sulfide and potassium sulfate. Potassium sulfide was observed to vaporize incongruently, the initial vapors beng predominantly potassium atoms, with minor species being S2 and various K-S molecules. The ratio of K/S2 in the vapor is very large initially and decreases steadily with prolonged heating. Several materials were evaluated for purposes of containing K2S/K2SO3 at temperatures > or = 800 C: Pt, Mo, W, quartz, machinable glass, BN, high density graphite, pyrolytic coated graphite, and alumina. Of these, only alumina was observed to be chemically inert to both K2S but reacted with K2SO3. The other materials were not suitable for either substance. Thermodynamic calculations based on measured vapor pressures and approximate free energy functions are described. Results from isothermal total mass loss experiments and from thermogravimetric experiments are also included. S.L.

N83-19813# Michigan Univ., Ann Arbor. Dept. of Chemistry.
METAL CATALYZED OLIGOMERIZATION REACTIONS OF ORGANOSILOXANES
M. David Curtis 28 Oct. 1982 12 p refs Submitted for publication
(Contract N00014-78-C-0191; NR Proj. 356-674)
(AD-A121439; TR-5) Avail: NTIS HC A02/MF A01 CSCL 11/9

Transition metal complexes, e.g., L2Pt(C2H4), L3RhCl, and L2Ir(CO)Cl (L=Ph3P), react with tetraalkyldisiloxanes, (HRR'Si)2O, to produce metallacycles featuring the transition metal, two silicons, and the oxygen in a four-membered ring, MSiOSi. When R=Me and R'=Ph, stereoselectivity in the formation of the metallacycle from a mixture of stereoisomers of the starting disiloxane is observed. The catalytic activity of these complexes for the oligomerization of the disiloxanes has been investigated in the hope of obtaining stereoregular silicones. It has been found that extensive rearrangements occur which redistribute the groups on the silicon atoms. Increased selectivity for the desired exchange type (SiO-groups for Si-H) was found when the catalysts were adsorbed on oxide supports. Although the goal of synthesizing stereoregular silicones has not yet been achieved, the results warrant further investigation. GRA

24 COMPOSITE MATERIALS

Includes laminates.

N83-19814*# Vought Corp., Dallas, Tex.
NASA SAMPLES Final Report
3 Dec. 1982 57 p
(Contract NAS9-15685)
(NASA-CR-167803; NAS 1.26:167803; V-22-IRPN-0977; DRD-MA-182T-Rev-1; M-1054B) Avail: NTIS HC A04/MF A01 CSCL 11D

Reinforced carbon-carbon specimen fabrication is reported. N.W.

N83-19815*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FLIGHT SERVICE EVALUATION OF COMPOSITE COMPONENTS ON BELL 206L AND SIKORSKY S-76 HELICOPTERS
Donald J. Baker Mar. 1983 14 p refs Presented at AHS Natl. Specialist's Meeting: Composite Structures, Philadelphia, 23-25 Mar. 1983 Prepared in cooperation with Army Aviation Research and Development Command, St. Louis, Mo.
(NASA-TM-84637; NAS 1.15:84637; AVRADCOM-TR-83-B-1) Avail: NTIS HC A02/MF A01 CSCL 11D

Progress on two programs to evaluate composite structural components in flight service on commercial helicopters is described. Thirty-six ship sets of composite components that include the litter door, baggage door, forward fairing, and vertical fin were installed on Bell Model 206L helicopters that are operating in widely different climatic areas. Four horizontal stabilizers and ten tail rotor spars that are production components on the S-76 helicopter were tested after prescribed periods of service to determine the effects of the operating environment on their performance. Concurrent with the flight evaluation, specimens from materials used to fabricate the components were exposed in ground racks and tested at specified intervals to determine the effects of outdoor environments. Results achieved from 14,000 hours of accumulated service on the 206L components, tests on a S-76 horizontal stabilizer after 1600 hours of service, tests on a S-76 tail rotor spar after 2300 hours service, and two years of ground based exposure of material coupons are reported. Author

N83-19816*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ENERGY ABSORPTION OF COMPOSITE MATERIALS
Gary L. Farley Mar. 1983 9 p refs Presented at Natl. Specialists' Meeting: Composite Structures, Mar. 1983; sponsored by American Helicopter Society Prepared in cooperation with Army Aviation Research and Development Command, Hampton, Va.
(NASA-TM-84638; NAS 1.15:84638; AVRADCOM-TR-83-B-2)

Avail: NTIS HC A02/MF A01 CSCL 11D

Results of a study on the energy absorption characteristics of selected composite material systems are presented and the results compared with aluminum. Composite compression tube specimens were fabricated with both tape and woven fabric prepreg using graphite/epoxy (Gr/E), Kevlar (TM)/epoxy (K/E) and glass/epoxy (Gl/E). Chamfering and notching one end of the composite tube specimen reduced the peak load at initial failure without altering the sustained crushing load, and prevented catastrophic failure. Static compression and vertical impact tests were performed on 128 tubes. The results varied significantly as a function of material type and ply orientation. In general, the Gr/E tubes absorbed more energy than the Gl/E or K/E tubes for the same ply orientation. The [0/ + or - 15] Gr/E tubes absorbed more energy than the aluminum tubes. Gr/E and Gl/E tubes failed in a brittle mode and had negligible post crushing integrity, whereas the K/E tubes failed in an accordian buckling mode similar to the aluminum tubes. The energy absorption and post crushing integrity of hybrid composite tubes were not significantly better than that of the single material tubes. Author

N83-19817*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SIMPLIFIED COMPOSITE MICROMECHANICS EQUATIONS FOR HYGRAL, THERMAL AND MECHANICAL PROPERTIES

Christos C. Chamis 1983 20 p refs Presented at the 38th Ann. Conf. of the Society of the Plastics Industry (SPI) Reinforced Plastics/Composites Inst., Houston, Tex., 7-11 Feb. 1983

(NASA-TM-83320; E-1561; NAS 1.15:83320) Avail: NTIS HC A02/MF A01 CSCL 11D

A unified set of composite micromechanics equations of simple form is summarized and described. This unified set can be used to predict unidirectional composite (ply) geometric, mechanical, thermal and hygral properties using constituent material (fiber/matrix) properties. This unified set also includes approximate equations for predicting (1) moisture absorption; (2) glass transition temperature of wet resins; and (3) hygrothermal degradation effects. Several numerical examples are worked-out to illustrate ease of use and versatility of these equations. These numerical examples also demonstrate the interrelationship of the various factors (geometric to environmental) and help provide insight into composite behavior at the micromechanistic level. Author

N83-19818# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

MOLECULAR LEVEL COMPOSITE OF PBT/ABPBI: PHASE RELATIONSHIPS, PROCESSING AND PROPERTIES Final Report, Jan. 1980 - Aug. 1981

T. Helminiak, W.-F. Hwang, D. Wiff, C. Benner, and G. Price Oct. 1982 57 p refs

(AF Proj. 2303)

(AD-A122059; AFWAL-TR-82-4039) Avail: NTIS HC A04/MF A01 CSCL 11/4

The concentrated solution phase relationships and bulk polymer morphology of a solvent/rigid rod/flexible coil system were investigated. The solvent was a mixture of two strong acids. The rigid rod polymer was poly-para-phenylene-benzbisthiazole (PBT). The flexible coil polymer was poly-2,5(6) benzimidazole (ABPBI). The concentrated solution and bulk polymer morphologies were investigated by means of polarized optical microscopy, small angle light scattering, scanning electron microscopy, and a wide angle X-ray diffraction techniques. Above a critical concentration, Ccr, the pseudo ternary solution separated into two coexisting phases, one optically anistropic (liquid crystalline) and the other isotropic. The anistropic domains were highly birefringent. They contained primarily the PBT macromolecules oriented preferentially along a domain axis. Numerical results of Ccr, determined experimentally, were in good agreement with calculated predictions. Aggregates composed of PBT molecules were observed to be dispersed in a continuous matrix for vacuum cast films. These results strongly indicate the dominance of entropic effects in the thermodynamics of rigid rod-like polymer flexible coil-like polymer mixtures. GRA

N83-19819# Naval Postgraduate School, Monterey, Calif. Dept. of Aeronautics.

A COMPUTER PROGRAM TO CALCULATE IN-PLANE AND FLEXURAL PROPERTIES OF SYMMETRIC LAMINATES ON THE HP-87 MICROCOMPUTER

Dennis R. Ferrell Sep. 1982 66 p refs

(AD-A122141; NPS-67-82-011) Avail: NTIS HC A04/MF A01 CSCL 09/2

The computation of parameters for symmetric laminates involves series of tedious calculations for both in plane and flexural properties. In order to alleviate the magnitude and complexity of calculations for complicated symmetric laminates, the program of this report was designed for a commercially available microcomputer, the Hewlett-Packard HP-87, and is based for the most part on program logic developed by the Air Force Wright Aeronautical Laboratories for the TI-59 handheld programmable calculator. Program logic is explained in detail with flowcharts and a full listing of the program is included. A description of the program logic provides the user with a comprehensive explanation of program operation. Author (GRA)

N83-19820# North Carolina Agricultural and Technical State Univ., Greensboro. School of Engineering.

IMPACT-INITIATED DAMAGE IN LAMINATED COMPOSITES Final Report

V. Sarma Avva 30 Sep. 1982 104 p refs

(Contract F49620-80-C-0050; AF Proj. 2303)

(AD-A122166; AFOSR-82-1038TR) Avail: NTIS HC A06/MF A01 CSCL 11/4

Due to the advantage of high strength to weight ratio, composite materials are being increasingly used in the design of aircraft components and structures. One of the problems that needs to be studied in detail in such applications is the effect of projectile impact on the strength carrying ability of composite structures. The mechanism of impact-induced crack propagation is not fully understood, yet. In the past few years, numerous efforts have been made to predict theoretically the residual strength of the high performance fiber composite materials subjected to foreign object damage (FOD). GRA

N83-19821# Naval Ship Research and Development Center, Bethesda, Md. Structures Dept.

STRUCTURAL EVALUATION OF AN ADVANCED COMPOSITE HYDROFOIL FOIL COMPONENT Final Report

William P. Couch, Longin Greszczuk, and Henry Chaskelis Nov. 1982 65 p refs

(SF43400391)

(AD-A122165; DTNSRDC-82/082) Avail: NTIS HC A04/MF A01 CSCL 14/2

An advanced composite foil test component (tapered box beam) was designed by the McDonnell Douglas Astronautics Company. Two identical box beams were fabricated for static and fatigue testing. Each consisted of two hybrid graphite epoxy skins bolted and bonded to three HY-130 steel spars. The box beams were tested to determine their structural behavior under a cantilever bending stress distribution due to a concentrated load, to establish a load versus stress relationship for the simulated sea load fatigue test, and to compare their response to cyclic loading with that of candidate metallic designs. In addition, initial flaws and subsequent damage as a result of static and cyclic loading were evaluated using various ultrasonic testing techniques. Initially, Box Beam 1 incurred delaminations to the inner surface of the tensile skin in the load application area at 80 percent of the preliminary maximum operating load (foil broach) of 60 kips. Attempted repairs and modifications in this area failed to fix this problem, and a subsequent proof test to 60 kips resulted in extensive delaminations to both surfaces of both skins; however, there did not appear to be any significant through-the-thickness damage as evaluated by ultrasonic test techniques. Box Beam 2 was initially tested to a static load of 30 kips to aid in the evaluation of out-of-plane stresses which were felt to have been the cause of failure to Box Beam 1. The results of this test were inconclusive. GRA

N83-19822# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
STUDIES OF ADVANCED AND COMPOSITE STRUCTURES Final Scientific Report, 15 Nov. 1980 - 31 Dec. 1981
Lawrence W. Rehfield Feb. 1982 13 p refs
(Grant AF-AFOSR-0056-81; AF Proj. 2307)
(AD-A122306; AFOSR-82-1016TR) Avail: NTIS HC A02/MF A01 CSCL 11/4

This final report summarizes the objectives and accomplishments of the three tasks pursued during a one-year grant from AFOSR to continue ongoing research in development of new bending and buckling theories for beams and plates, oriented toward composite structures, experimental investigation of the effects of delamination on structural response of composite panels, and damage tolerance of isogrid composite structure, a stiffening concept that employs a repetitive equilateral triangular pattern of ribs. Papers, reports, and presentations resulting from this research are listed. In Task 1 a new theory of bending is developed including effects of transverse shear strain, transverse normal strain, and section warping. Included are a dynamic theory for planar bending of homogeneous beams, static theory for homogeneous plates, buckling theory for homogeneous columns, planar bending theory of composite laminates, theory for laminated plates, and a theory for bending and buckling of stiffened plates. Task 2 investigates structural consequences of delamination using a series of quasi-isotropic symmetric ply layup composite panels with single delaminated zones between the central plies, all delaminations of the same size (ten percent of the panel area) but all of different shapes. GRA

N83-19823# Oak Ridge National Lab., Tenn.
PROPERTIES AND TESTING OF LOOSE-FILL CELLULOSIC INSULATION
D. W. Yarbrough, D. L. McElroy, and W. W. Harris Feb. 1982 92 p refs
(Contract W-7405-eng-26)
(DE82-011298; ORNL/TM-6433) Avail: NTIS HC A05/MF A01

New methods for measuring thermal resistance, permeability to air, settled density, and compressibility of loose-fill cellulosic insulation (LFCI) are described. The resultant property measurements are discussed. Chemical analyses were completed on the LFCI in the sampling. The results represent a first attempt to assess the variability of products and fire-retardant formulations. Chemical characteristics have been compared with test performance. Compounds present in the insulations tested were not identified directly but were deduced from elemental analyses. The amount of water-soluble fire retardant in LFCI products were found to vary from 14 to 36 wt %. Formulations containing from one to five separate compounds were identified. It was observed that products containing above 20 wt % fire-retardant chemicals had the highest acceptance (pass) rate for the combustion tests specified by federal specification HH-I-515D. The overall performance of the LFCI materials tested was poor as measured by HH-I-515D methods. Results for the important smoldering-combustion test yielded passing rates from 30.6 to 62.7%. Seventy-five percent of the LFCI specimens passed the radiant panel test. The percentage of the sample that passed both the smoldering-combustion and the radiant panel test ranged from 42 to 50%. DOE

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N83-19824*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Mechanical Engineering.
EXPERIMENTAL STUDY OF THE THERMAL-ACOUSTIC EFFICIENCY IN A LONG TURBULENT DIFFUSION-FLAME BURNER Final Report
J. R. Mahan Feb. 1983 72 p refs
(Grant NAG3-124)
(NASA-CR-170003; NAS 1.26:170003) Avail: NTIS HC A04/MF A01 CSCL 21B

A two-year study of noise production in a long tubular burner is described. The research was motivated by an interest in understanding and eventually reducing core noise in gas turbine engines. The general approach is to employ an acoustic source/propagation model to interpret the sound pressure spectrum in the acoustic far field of the burner in terms of the source spectrum that must have produced it. In the model the sources are assumed to be due uniquely to the unsteady component of combustion heat release; thus only direct combustion-noise is considered. The source spectrum is then the variation with frequency of the thermal-acoustic efficiency, defined as the fraction of combustion heat release which is converted into acoustic energy at a given frequency. The thrust of the research was to study the variation of the source spectrum with the design and operating parameters of the burner. Author

N83-19825*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A CHEMICAL KINETIC MIXTURE FOR THE IGNITION OF SILANE/HYDROGEN MIXTURES
Casimir J. Jachimowski and Allen G. McLain Feb. 1983 20 p refs
(NASA-TP-2129; L-15542; NAS 1.60:2129) Avail: NTIS HC A02/MF A01 CSCL 21B

A chemical kinetic reaction mechanism for the oxidation of silane/hydrogen mixtures is presented and discussed. Shock-tube ignition delay time data were used to evaluate and refine the mechanism. Good agreement between experimental results and the results predicted by the mechanism was obtained by adjusting the rate coefficient for the reaction SiH3 + O2 yields SiH2O + OH. The reaction mechanism was used to theoretically investigate the ignition characteristics of silane/hydrogen mixtures. The results revealed that over the entire range of temperature examined (800 K to 1200 K), substantial reduction in ignition delay times is obtained when silane is added to hydrogen. Author

N83-19826*# National Aeronautics and Space Administration. Pasadena Office, Calif.
COMBUSTION ENGINE SYSTEM Patent Application
John Houseman (JPL, California Inst. of Tech., Pasadena) and Gerald E. Voecks, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 16 Aug. 1982 35 p
(NASA-Case-NPO-14565-2; US-Patent-Appl-SN-408266) Avail: NTIS HC A03/MF A01 CSCL 07D

A flow through catalytic reactor which selectively catalytically decomposes methanol into a soot free hydrogen rich product gas utilizing engine exhaust at temperatures of 200 to 650 C to provide the heat for vaporizing and decomposing the methanol is described. The reactor is combined with either a spark ignited or compression ignited internal combustion engine or a gas turbine to provide a combustion engine system. The system may be fueled entirely by the hydrogen rich gas produced in the methanol decomposition reactor or the system may be operated on mixed fuels for transient power gain and for cold start of the engine system. The reactor includes a decomposition zone formed by a plurality of elongated cylinders which contain a body of vapor permeable, methanol decomposition catalyst preferably a shift catalyst such as copper-zinc. NASA

N83-19827# Exxon Research and Engineering Co., Florham Park, N.J.
EDS COAL-LIQUEFACTION PROCESS DEVELOPMENT. PHASE 5: EDS PRODUCT QUALITY Final Report
W. R. Epperly Sep. 1982 266 p Sponsored in part by Exxon Co., Inc., Electric Power Research Inst., Japan Coal Liquefaction Development Co., Phillips Coal Co., Anaconda Minerals Co., Ruhrkohle, AG, and ENI

(Contract DE-FC05-77ET-10069)
(DE83-002226; DOE/ET-10069/T22; FE-2893-97) Avail: NTIS (US Sales Only) HC A12/MF A01; DOE Depository Libraries

Research efforts directed at end use applications of raw and upgraded EDS products are summarized. The end use applications, including any upgrading by hydrotreatment required to ensure adequate performance, are identified for products derived from Illinois (Monterey mine) and Wyoming (Wyodak mine) coals. The EDS product quality studies identified potential end uses for coal derived liquids and evaluated properties of these liquids relative to requirements of these potential applications. Areas pertaining to product quality requiring further development are highlighted. Consideration of market needs combined with generic properties of EDS-derived products may suggest a clean product slate (naphtha/distillate) as the most desirable, long range EDS product objective. Properties of lighter EDS product streams (naphtha, distillates) are essentially independent of liquefaction operating conditions for a given coal. This applies to both coal only and bottoms recycle operations. With the exception of heterocyclic content, primarily sulfur, properties of lighter EDS product streams (naphtha, distillates) are very nearly coat independent. DOE

N83-19828# Pennsylvania Univ., Philadelphia. Dept. of Materials Science and Engineering:
HIGH-CONDUCTIVITY-PROTON SOLID ELECTROLYTES Technical Progress Report, 1 Mar. 1980 - 1 Mar. 1982
Gregory C. Farrington 1 Oct. 1982 7 p refs
(Contract DE-AC02-80ER-10597)
(DE83-003125; DOE/ER-10597/3) Avail: NTIS HC A02/MF A01

The beta and beta'' alumina family of protonic conductors are promising as solid electrolytes. Investigations of the preparation, stability, conductivity, and structure of hydronium beta'' alumina were conducted during the past year. DOE

N83-19829# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
COAL PYROLYSIS BY HOT SOLIDS FROM A FLUIDIZED-BED COMBUSTOR Final Technical Report, Jun. 1977 - Jun. 1982
J. P. Longwell, L. B. Evans, J. B. Howard, W. A. Peters, J. K. Floess, L. Fong, C. Chen, and J. Yeboah Jun. 1982 68 p refs
(Contracts DE-AT01-76ET-10703; EX-76-A-01-2295)
(DE83-003344; DOE/ET-10703/1301) Avail: NTIS HC A04/MF A01

The effect of adding calcined dolomite stone to the fluidized-bed pyrolysis of coal and oil shale on product quality and product distribution has been studied. This work has provided information relevant to systems where heat is generated by fluidized-bed combustion in the presence of a sulfur acceptor (dolomite) and where the hot stone from the combustor is used in a second reactor to provide heat for pyrolysis. A scoping economic analysis indicated that, for coal, the pyrolysis gas and liquids produced are lower cost than gas and liquids produced by single-product gasification and liquefaction processes. The presence of calcium oxide during pyrolysis was found to improve gas heating value by CO2 removal and to essentially eliminate H2S. Gas yield was increased at the expense of liquid yield (20 to 30% reduction). Tar properties were improved by reduction of oxygen content, however, little sulfur or nitrogen removal was observed. Used stone from a fluidized-bed combustor gave results comparable to fresh stone with little reduction of the calcium sulfate present in the used stone. Since Colorado oil shale contains dolomite and calcite, stones from spent-shale combustion might be expected to have similar effects on product yields. CO2 and H2S removal from the gas were observed. DOE

N83-19830# Pittsburgh Univ., Dept. of Metallurgical and Materials Engineering.
ASSOCIATION OF POLYPHOSPHAZENES IN SOLUTION Interim Technical Report
S. V. Peddada and J. H. Magill 30 Sep. 1982 15 p refs Submitted for publication
(Contract N00014-77-C-0310; NR Proj. 356-644)
(AD-A121387; Rept-8) Avail: NTIS HC A02/MF A01 CSCL 11/9

Intrinsic viscosity data on poly(bis(trifluoroethoxy)phosphazene) (PBFP) in acetone exhibited negative slopes in Huggin's-Kraemer's plots. Solutions of PBFP at concentrations of 0.3, 0.4, 0.6 and 0.8 g/100 ml were examined in transmission with an FTIR spectrometer. The increase in absorptivity of the solutions was much less than proportional to the increase in polymer concentration, indicating that the calculated extinction coefficient decreased as the polymer concentration increased, implying polymer associated in solution. Author (GRA)

N83-19831# Pennsylvania State Univ., University Park. Dept. of Mechanical Engineering.
COMBUSTION OF AGGLOMERATES FORMED BY CARBON SLURRY FUELS Final Report, Jul. 1981 - Jun. 1982
G. A. Szekely, Jr. and G. M. Faeth Wright-Patterson AFB, Ohio AFWAL Sep. 1982 145 p refs
(Contract F33615-81-K-2039; AF Proj. 3048)
(AD-A121889; AFWAL-TR-82-2085) Avail: NTIS HC A07/MF A01 CSCL 21/2

The reaction of carbon-black agglomerates, formed during the combustion of carbon slurry fuels, is considered. A monodisperse stream of agglomerates (10-75 micrometers initial diameter) was observed in the post-flame region of a flat-flame burner yielding particle size, mass, temperature and velocity as a function of time in the burner gases. Test considered burner fuel equivalence ratios of 0.2-1.4, and gas temperatures of 1620-1960 K at atmospheric pressure. Several carbon-black formulations were considered: monodisperse blacks having ultimate carbon black particle sizes of 70, 150 and 300 nm, and a blend involving 50% mass loadings (each) of carbon blacks having ultimate carbon particle sizes of 70 and 300 nm. The measurements were compared with a shrinking sphere model of the process using two alternative reaction mechanisms (carbon reaction with O2 and OH or with O2, CO2 and H2O). Empirical transport enhancement and area/reactivity parameters were defined to allow for gas motion and reaction in agglomerate pores. These parameters were determined form the data. Both reaction mechanisms satisfactorily correlated the data using empirical parameters which were relatively independent of ambient conditions, particle size and extent of reaction--aside from an initial transient period where the pore structure of the agglomerate developed. The rate of combustion of monodisperse blacks increased slightly as the ultimate carbon-black particle size was reduced. The burning rate of the carbon-black blend was lower than the other fuels considered during the investigation yielding residence times for reaction 10-50% longer than monodisperse blacks at comparable conditions. Author (GRA)

N83-19832# Miami Univ., Coral Gables, Fla. Dept. of Chemistry.
COMPOSITIONAL, ATOMIC AND MOLECULAR ANALYSIS IN SUPPORT OF MATERIALS NEEDS OF THE U.S. AIR FORCE Final Report, 12 May 1980 - 15 May 1982
J. E. Katon Wright-Patterson AFB, Ohio AFWAL Sep. 1982 25 p refs
(Contract F33615-80-C-5002; AF Proj. 2418)
(AD-A120881; AFWAL-TR-82-4096) Avail: NTIS HC A02/MF A01 CSCL 07/4

Work performed during the period May 1980-May 1982 in support of various Air Force programs is summarized. The work covers method development, support programs, service functions, materials characterization and development and application of analytical chemical techniques of various kinds. In addition, research in the areas of molecular structure determination and materials characterization was performed. Author (GRA)

N83-19833# Case Western Reserve Univ., Cleveland, Ohio.
APPLICATIONS OF IN SITU MOSSBAUER EFFECT SPECTROSCOPY TO THE STUDY OF ELECTRODE-ELECTROLYTE INTERFACES
D. A. Scherson, E. B. Yeager, J. Eldridge, M. E. Kordesch, and R. W. Hoffman 1 Sep. 1982 25 p
(Contract N00014-75-C-0953)

(AD-A122091; TR-54) Avail: NTIS HC A02/MF A01 CSCL 07/4

Mossbauer effort spectroscopy has emerged as a powerful tool in the in situ examination and analysis of the physico-chemical properties of active nuclei containing species either adsorbed at solid-liquid interfaces or present in layers on electrode surfaces. Applications are given for in situ Mossbauer in emission and transmission modes as well as illustration of the newly developed in situ electron conversion Mossbauer spectroscopy. Several aspects of the experimental technique are discussed and the literature in the area is reviewed. Author (GRA)

N83-19834# Michigan Univ., Ann Arbor. Dept. of Chemistry.
REDISTRIBUTION REACTIONS OF METHYLSILOXANES CATALYZED BY TRANSITION METAL COMPLEXES
W. A. Gustavson, P. S. Epstein, and M. D. Curtis 29 Oct. 1982 30 p refs
(Contract N00014-78-C-0191)
(AD-A121419; TR-4) Avail: NTIS HC A03/MF A01 CSCL 07/3

Redistribution reactions of a variety of hydrogen-substituted siloxanes are catalyzed by various transition metal complexes of iridium and rhodium. The products arise from breaking and remaking of Si-C, Si-H, and Si-O bonds. Siloxanes not possessing a Si-H bond are inert under the conditions studied. The most favored reaction pathway appears to preferentially scramble the groups directly attached to the silicon bearing the hydrogen atom. A new cyclo-iridiadisiloxane, L2(CO)(H)-Ir(SiMeROSiMeR) (L = Ph3P, R = Me3SiO) is reported. This compound exists in three isomeric forms as a consequence of the spatial arrangements of the R and Me groups on the ring. Author (GRA)

N83-19835# American Cyanamid Co., Bound Brook, N. J. Discovery Research Dept.
AQUEOUS PEROXYOXALATE CHEMILUMINESCENCE Final Report
Arthur G. Mohan, Shin-Shyong Tseng, Michael M. Rauhut, Frank J. Arthen, and Richard G. Dulina Jan. 1982 163 p refs
(Contract N00014-77-C-0634)
(AD-A121396) Avail: NTIS HC A08/MF A01 CSCL 20/6

A quantum yield of 7.2% in aqueous solution has been obtained from the reaction of hydrogen peroxide with bis(N-2-(N'-methyl-2'-pyridinium)ethyl-N-trifluoromethylsulfonyl)oxamide in the presence of sulfonated rubrene as fluorescer. Light capacity of this system is 62 lumen hours per liter of solution. A system using bis-hexylrubrene in an emulsified solvent gave a quantum yield of 8.3%. A record high quantum yield of 34% in an organic solvent was achieved with bis-(N-(2,4,5-trichlorophenyl)-N-trifluoromethanesulfonyl)oxamide, hydrogen peroxide and a fluorescer. GRA

N83-19836# University of Southern California, Los Angeles. Dept. of Mechanical Engineering.
GAS INTERACTION AND LIQUID PHASE REACTIONS ASSOCIATED WITH SWIRL COMBUSTION AND COMBUSTION INSTABILITY Final Report, 1 Jun. 1977 - 30 Jun. 1982
P. Roy Choudhury and Melvin Gerstein Aug. 1982 102 p refs
(Contract AF-AFOSR-0222-82; AF Proj. 2308)
(AD-A121714; AFOSR-82-0987TR) Avail: NTIS HC A06/MF A01 CSCL 21/2

Three fundamental problems related to the combustion efficiency and smoother burning of an airbreathing propulsion system are studied. The first problem deals with the coupling of evaporation/decomposition of a liquid fuel and a novel technique of handling a slurry fuel. It has been found that at higher pressures liquid phase decomposition of a fuel is one of the primary sources of particulate formation and combustion inefficiency of an airbreathing combustor. Preliminary experiments and analyses of droplet shattering of a slurry fuel by pulsed low energy irradiation at selected frequencies show that this novel method of droplet break up might enable one to use slurry fuels without the usual problem of particle clustering. The second phase of the research dealing with vortex combustion and the use of gas jets in the role of vortex amplifier and swirl generator identifies fundamental methods of increasing combustion efficiency, promoting smoother burning and decreasing the characteristics length of a burner. Finally the study of the coupling between the inlet pressure oscillation and combustion instability has identified the role of frequency, amplitude, wave-form and phase angle leading to pressure magnification in the burner. Through vortex control and a feedback system it may be possible to eliminate combustion instability. Author (GRA)

N83-19837# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
CORRELATION OF CHEMICAL CHARACTERISTICS WITH FUEL PROPERTIES BY GAS CHROMATOGRAPHY Interim Report, Aug. 1980 - Dec. 1981
D. L. Present, F. M. Newman, and L. L. Stavinoha Dec. 1981 51 p refs
(Contracts DAAK70-82-C-0001; DAAK70-80-C-0001)
(AD-A121708; SWRI-6800-124; AFLRL-153) Avail: NTIS HC A04/MF A01 CSCL 07/4

Standard tests such as those published in ASTM are used to determine a fuel's properties. As new fuels are introduced, it becomes necessary to characterize them by applying available standard test methods and chemical/physical characterization techniques in a process which is costly, time consuming and developmental by its very nature. Because of the technical advances in digital computers and gas chromatography, it has become feasible to attempt to develop correlations between gas chromatographic data and some chemical/physical properties. These, it turn, may be related to a fuel's performance. Eight test fuels were selected for this preliminary work because of their known stability and chemical/physical properties. A modified ASTM D 2887 boiling point distribution (BPD) method was developed to yield component specific identification in addition to BPD consistant with the conventional D 2887 method. The data from this modified method may be used in correlation equations to automatically calculate Reid Vapor Pressure, ASTM D 86, ASTM D 1160, API gravity, flash point, viscosity, and freeze point. In addition, the capability to 'profile' several chromatograms for direct visual comparison has been developed and added to the system. Other analytical techniques, such as NMR, were evaluated for their possible contribution to this correlation development.
Author (GRA)

N83-19838# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
DETECTION OF ROCKET FUEL COMPONENTS BY MULTIPHOTON PHOTOIONIZATION MASS SPECTROSCOPY
Charles M. Klimcak 1 Oct. 1982 31 p refs
(Contract F04701-82-C-0083)
(AD-A120570; TR-0083(3945-11)-1; SD-TR-82-70) Avail: NTIS HC A03/MF A01 CSCL 07/4

Multiphoton photoionization spectroscopy has been employed in conjunction with time-of-flight mass spectrometry in order to ascertain analytical detection limits for some volatile components of rocket fuel mixtures. Detection of naphthalene, 2-methylnapthalene, and 4-vinylcyclohexene at the low part per trillion level is readily accomplished with this technique. The laser wavelengths and pulse energies that are required for detection are reported along with the multiphoton optical and mass spectra. GRA

N83-19839# Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. Energy and Water Resources Lab.
HIGH-TEMPERATURE DESALINATION CAPABILITY OF TFC 1501 REVERSE OSMOSIS ELEMENT Final Technical Report
Haruhiro H. Goto, Peder B. Pederson, and Janet O. Hall Jul. 1982 34 p
(DA Proj. 1F4-64717-DL-39)
(AD-A121059; MERADCOM-2367) Avail: NTIS HC A03/MF A01 CSCL 13/2

This report covers an investigation conducted to evaluate the desalination capability of TFC 1501 reverse osmosis elements when operated with feedwater the temperature of which is substantially above the maximum operating temperature (113 F) specified by the manufacturer. The results of the investigation indicate: (1) The

elements were not degraded in desalinating capability following exposure for 400 h to feedwater at approximately 130 F; (2) the production rate of the elements dropped less than 5 percent following exposure for 400 h to water at approximately 130 F and 200 h at 130 F and 600 lb/sq in. Author (GRA)

N83-19840# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
A PARALLEL SIMULATION SCHEME FOR THE RAPID ACCURATE CALCULATION OF NONIDEAL ELECTROCHEMICAL TRANSIENTS
Edward W. Schindler, Jr. and Michael J. Weaver 18 Nov. 1982 12 p refs Submitted for publication Sponsored in part by AFOSR
(Contract N00014-79-C-0670)
(AD-A122162; TR-10) Avail: NTIS HC A02/MF A01 CSCL 07/4

A method for the digital simulation of certain electrochemical transients has been developed which involves the parallel calculation of a system of interest and an ideal analog to which an exact solution is available. A reduction in computer time of several orders of magnitude is realized compared to conventional simulations. Author (GRA)

N83-19841# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
THE SIGNIFICANCE OF ELECTROCHEMICAL ACTIVATION PARAMETERS FOR SURFACE-ATTACHED REACTANTS
Joseph T. Hupp and Michael J. Weaver 18 Nov. 1982 18 p refs Submitted for publication Sponsored in part by AFOSR
(Contract N00014-79-C-0670)
(AD-A122161; TR-9) Avail: NTIS HC A02/MF A01 CSCL 07/4

The interpretation of activation parameters for electrochemical reactions involving surface-attached or adsorbed reactants is considered, and compared with the corresponding experimental quantities for solution-phase reactants. The relation between the experimental activation parameters and the theoretically relevant quantities describing the energetics of heterogeneous electron transfer is summarized; this relationship is shown to be especially straightforward for surface-attached reactants. GRA

N83-19842# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
SPECIFIC ADSORPTION OF HALIDE AND PSEUDOHALIDE IONS AT ELECTROCHEMICALLY ROUGHENED VERSUS SMOOTH SILVER-AQUEOUS INTERFACES
Joseph T. Hupp, D. Larkin, and Michael J. Weaver Nov. 1982 43 p refs
(Contract N00014-79-C-0670)
(AD-A122187; TR-11) Avail: NTIS HC A03/MF A01 CSCL 20/8

The differential capacitance of electrochemically roughened silver surfaces in mixed perchlorate electrolytes containing chloride, bromide, iodide, thiocyanate, or azide anions has been measured as a function of electrode potential and anion concentration. These results are compared with corresponding data for electropolished of the silver in order to ascertain the influence of surface roughening on the double-layer structure and composition of polycrystalline silver-aqueous interfaces. The surface concentrations of specifically adsorbed anions were obtained from these capacitance-potential data using a Hurwitz-Parsons type of analysis. Although electrochemical roughening by means of a conventional oxidation-reduction cycle in chloride media is a prerequisite to the appearance of Surface-Enhanced Raman scattering (SERS) for these absorbates, it yields only moderate (ca. 1.5 to 2-fold) increases in the actual surface area and has a relatively minor effect on their average surface concentration. However, roughening does induce noticeable changes in the morphology of the capacitance-potential curves which are traced to alternations in the surface-crystallite structure. Comparisons between the potential dependence of SERS with corresponding capacitance-potential data indicate that anion coverages close to a monolayer are necessary for stable SERS. GRA

N83-19843# Pennsylvania State Univ., University Park. Dept. of Chemistry.
SECONDARY ION MASS SPECTRO STUDIES OF ELECTRODE SURFACES Final Scientific Report, 1 Oct. 1980 - 30 Aug. 1982
Nicholas Winograd Aug. 1982 20 p refs
(Grant AF-AFOSR-0002-80; AF Proj. 2303)
(AD-A122213; AFOSR-82-1032TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

The major objective of this work is to develop secondary ion mass spectrometry (SIMS) and other ancilliary modern surface analysis methods as tools to elucidate electrochemical processes. The research effort is devoted both to understanding the information inherent in the surface spectroscopies and to using these methods to characterize the chemical composition of modified electrode surfaces. The SIMS results are analyzed in terms of the composition of molecular cluster ions ejected from the electrode surface. The interpretation is based on a classical dynamics model of the impact of a 1 keV Ar(+) ion into the sample. This model helps to relate the composition of these clusters to the composition of the surface. The approach should be a general one, applicable to metals, metal oxides, alloys and organic films. In short, with all of these studies we hope to demonstrate that SIMS, together with other surface spectroscopies, are powerful tools for electrochemists, providing new information relevant to corrosion processed, electrocatalysis and fuel cell technology. GRA

N83-19844# California Univ., Irvine. Dept. of Chemistry.
RATE CONSTANT OF THE OH + H2O2 YIELD HO2 + H2O REACTION Final Report
Mario J. Molina, Lusia T. Molina, Craig A. Smith, and John J. Lamb Jul. 1982 24 p refs
(Contract DTFA01-80-C-10084)
(AD-A122207; FAA/EE-82-17) Avail: NTIS HC A02/MF A01 CSCL 07/2

Absolute rate constants for the reaction OH + H2O2 HO2 + H2O have been measured using the flash photoysis resonance fluorescence technique over the temperature range 241 to 413 K and at 1 atm helium. H2O2 concentrations were measured by ultra violet and infrared absorption spectrophotometry. The rate constant at 294 K was found to be K sub 1 = 1.8 + or 0.3 x 10 to the minus 12th power cu cm per molecule per sec, in agreement with recent literature values. The results yield a curved Arrhenius plot, with slight increase in the rate constant at the lower temperatures. GRA

N83-19845# IBM Watson Research Center, Yorktown Heights, N.Y.
EMPTY ORBITALS OF ADSORBATES DETERMINED BY INVERSE UV-PHOTOEMISSION
F. J. Himpsel and Th. Fauster 1982 12 p refs
(Contract F49620-81-C-0089; AF Proj. 2306)
(AD-A122307; AFOSR-82-1047TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

We have determined the position of the lowest empty orbitals of CO and O chemisorbed on Ni(111) by inverse photo-emission in the ultraviolet. The 2 pi orbital of CO is lowered by 4.5eV upon chemisorption and broadened to a 5.5eV wide resonance centered 3.5eV above E sub F. Chemisorbed oxygen has a sharp 2p state at 0.5eV above E sub F in agreement with band calculations. This state disappears upon oxide formation. Author (GRA)

N83-19846# Naval Coastal Systems Center, Panama City, Fla. Diving and Salvage Ship Husbandry Branch.
THE EFFECTS OF CHEMICAL HYDRATION LEVEL ON CARBON DIOXIDE ABSORPTION BY HIGH PERFORMANCE SODASORB
A. Purer, G. A. Deason, and M. L. Nuckols Nov. 1982 11 p refs
(AD-A122290; AD-F200044; NCSC-TM-363-82) Avail: NTIS HC A02/MF A01 CSCL 06/11

Investigation of the effects of carbon dioxide absorbent hydration level as related to carbon dioxide absorption efficiency with both water vapor saturated and dry carrier gases is reported. Absorbent moisture content studies ranged from 0.6 to 20.1 percent at carrier gas linear velocities of 10 to 20 centimeters per second.

For a dry carrier gas, increased carbon dioxide absorption efficiency correlates directly with an increase in absorbent hydration level. A more complex relationship was observed for a saturated carrier gas; however, the general trend was for carbon dioxide absorption efficiency to increase with decreasing absorbent moisture content. Author (GRA)

N83-19847# Texas Univ., Austin. Dept. of Chemistry.
SYNTHESIS OF NOVEL FLUORINE COMPOUNDS: NEW EXPERIMENTAL CHALLENGES IN ELEMENTAL FLUORINE CHEMISTRY Final Report, 1 Jun. 1978 - 31 May 1982
Richard J. Lagow 31 May 1982 9 p refs
(Grant AF-AFOSR-3658-78; AF Proj. 2303)
(AD-A122305; AFOSR-82-1037TR) Avail: NTIS HC A02/MF A01 CSCL 07/3

A series of highly branched perfluorocarbon polyethers were prepared and are being characterized. Thermal analysis shows that some of the branched polyethers are stable to about 420 degrees C. The synthetic scheme involves partial direct fluorination with diluted molecular fluorine of a hydrocarbon ester, followed by conversion of the carboxyl groups with sulfur tetrafluoride. GRA

N83-19848# Princeton Combustion Research Labs., Inc., N.J.
ANALYSIS OF COMBUSTION OSCILLATIONS IN HETEROGENEOUS SYSTEMS Final Report, 15 Mar. 1981 - 14 Mar. 1982
Moshe Ben-Reuven and Martin Summerfield Jun. 1982 54 p refs
(Contract F49620-81-C-0018; AF Proj. 2308)
(AD-A122301; PCRL-FR-82-004; AFOSR-82-1017TR) Avail: NTIS HC A04/MF A01 CSCL 21/2

The objectives for the present phase of research are critical literature survey, to determine the mechanisms which could lead to velocity coupled instability, and the various existing methods, analytical and experimental, related to its investigation, and perform order of magnitude analyses to determine which of the proposed driving mechanisms is plausible and warrants further analysis. Ultimately, the objective is to develop a comprehensive analytical model, capable of prediction of this type of instability in some relatively simple cases. This study is coupled to an experimental investigation by UTC/CSD, headed by Dr. Robert Brown, to simulate nonsteady internal flowfields, in both controlled cold-flow, and combustion environments. The literature survey of velocity coupled instability has been completed. Preliminary order of magnitude analyses of two distinct driving mechanisms of instability, namely acoustic/core-combustion coupling, and viscous/acoustic interaction have also been completed. A similar study on the effect of acoustic/small scale turbulence is underway, and will be reported (along with its full related literature) following completion of the present phase of study. GRA

N83-19849# Naval Research Lab., Washington, D. C. Combustion and Fuels Branch.
COMBUSTION SCALING AND MODELING GAS MIXING DATA IN NRL 5000-LITER FACILITY WITH FLOW OBSTACLE Final Report
S. R. Lustig, D. Indritz, J. P. Stone, and F. W. Williams 18 Nov. 1982 131 p refs
(RR0130144)
(AD-A122337; AD-E000515; NRL-8550) Avail: NTIS HC A07/MF A01 CSCL 21/2

Gas mixing rates were studied in a 5000-liter cylindrical tank during pressurization from 1 to 2 atmospheres by observation of gas temperatures with 13 thermocouple probes. Tests were performed with different nozzle arrangements. One rectangular obstacle, 46 x 46 x 100 cm (18 x 18 x 39-1/2 in.) was used to impede gas flow and mixing in the chamber. Instantaneous pressurant concentrations were inferred from temperature measurements. Data are reported from three nonfire conditions where dry air was used as both the resident and pressurant gases. Pressurant deviation statistics indicate that adequate mixing is accomplished within one and one half dumping times following pressurization for all configurations studied. GRA

N83-19850# Indiana Univ., Bloomington. Dept. of Chemistry.
A NEW BACKGROUND-CORRECTION METHOD FOR ATOMIC ABSORPTION SPECTROMETRY Interim Technical Report
S. B. Smith, Jr. and G. M. Hieftje 7 Dec. 1982 34 p refs Submitted for publication Sponsored in part by NSF
(Contract N00014-76-C-0838; NR Proj. 051-622)
(AD-A122332; INDU/DC/GMH/TR-82-51; TR-60) Avail: NTIS HC A03/MF A01 CSCL 07/4

A new method is described and tested for background correction in atomic absorption spectrometry. Applicable to flame or furnace atomizers, the method is capable of correcting backgrounds caused by molecular absorption, particulate scattering, and atomic-line overlap, even up to an absorbance value of three. Like the Zeeman approach, the new method applies its correction very near the atomic line of interest, can employ single-beam optics, and requires no auxiliary source. However, no ancillary magnet or other costly peripherals are required and working curves are single-valued. The new technique is based on the broadening which occurs in a hollow-cathode spectral line when the lamp is operated at high currents. Under such conditions, the absorbance caused by a broad-band background contributor remains as high as when the lamp is operated at conventional current levels. Background correction can therefore be effected by taking the difference in absorbances measured with the lamp operated at high low currents. The new technique is evaluated in its ability to correct several different kinds of background interference and is critically compared with competitive methods. GRA

N83-19851# United Technologies Research Center, East Hartford, Conn.
RESONANT CARS DETECTION OF HYDROXYL RADICALS Annual Report, 1 Aug. 1981 - 31 Jul. 1982
James F. Verdieck Jul. 1982 6 p refs
(Contract F49620-81-C-0063; AF Proj. 2308)
(AD-A122329; R82-955655; AFOSR-82-1040TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

Research being performed under this contract is directed toward extending the proven CARS diagnostic technique, presently limited to majority species in combustion, to minority species, through the use of resonantly enhanced CARS. Measurements will be made on the OH radical in a flame. Two tunable, narrowband dye lasers, simultaneously driven by a pulsed, frequency-doubled neodymium-YAG laser have been assembled and tested. Conversion of the dye laser fundamental frequency into UV, required for resonance excitation of OH, has been achieved for both systems. Moreover, an automatic tracking frequency doubling device which maintains constant UV power output as the fundamental frequency is tuned, has been installed on one of the dye lasers. A fine-scale, multielement diffusion burner using either H2/O2 or CH4/O2 has been tested for stability and uniformity. OH emission spectra have been observed for the 0-0 and 1-0 bands of the doublet pie 3/2 - doublet sigma 1/2 system. The search for resonant CARS in the OH radical is underway. GRA

N83-19852# Northwestern Univ., Evanston, Ill. Center for Materials Research.
PROPERTIES OF SUPPORTED METAL CATALYSTS Summary Progress Report
John B. Butt, Robert L. Burwell, Jr., and Jerome B. Cohen Oct. 1982 34 p refs Sponsored in part by the American Chemical Society and the Ipatieff Fund
(Contract DE-AC02-77ER-04254)
(DE83-002790; DOE/ER-04254/5) Avail: NTIS HC A03/MF A01

Work accomplished during the past three years is reviewed. The following topics are discussed: history of the project; scientific background; preparation of Pd/SiO2 catalysts; surface chemistry; wide angle X-ray scattering, small angle X-ray scattering, extended X-ray absorption fine structure; isotopic exchange between deuterium and cyclopentane; isotopic exchange between deuterium and neohexane; hydrogenolysis of methylcyclopropane; hydrogenation of propylene; cobalt-rhodium/silica gel. Summary and conclusions as well as some residual problems are presented. DOE

N83-19853# New York State Univ., Binghamton. Dept. of Chemistry.
DESULFURIZATION WITH TRANSITION-METAL CATALYSIS Quarterly Technical Progress Report, 27 Dec. 1981 - 27 Mar. 1982
John J. Eisch 28 Apr. 1982 5 p
(Contract DE-FG22-81PC-40782)
(DE82-013964; DOE/PC-40782/T1) Avail: NTIS HC A02/MF A01

The following studies were initiated or continued: (1) study of the desulfurizing action of nickel salts or organonickel complexes, combined with metal hydrides, or SRC plant liquids; (2) continuing survey of other model organosulfur compounds that might undergo desulfurization with such nickel reagents, either performed or prepared in situ; (3) evaluation of molybdenum complexes as desulfurizing agents; (4) formation of nickel hydrides by oxidative additions and their behavior as desulfurizing agents; and (5) exploration of the denitrogenation of quinolines by reductive hydrolysis. The following observations have been made: (1) SRC liquids (code No. M-51) containing 0.5% of sulfur underwent loss of 80% of their sulfur when treated with nickel salts, pyridine and a metal hydride; (2) sulfones can be reduced to hydrocarbons by the joint action of nickel salts and metal hydrides; (3) under conditions thus far tried, molybdenum salts and metal hydrides appear to be desulfurizing agents that are inferior to those of nickel or cobalt; (4) nickel(0) complexes interact with aluminum hydrides to evolve hydrogen; and (5) some model 1,2-dihydroquinolines are being synthesized to test the feasibility of reductive denitrogenation. DOE

N83-19854# General Electric Co., Philadelphia, Pa. Research and Engineering Dept.
COAL DESULFURIZATION BY A MICROWAVE PROCESS Progress Report
P. D. Zavitsanos, J. A. Golden, and K. W. Bleiler Jan. 1982 25 p refs
(Contract DE-AC22-80PC-30142)
(DE82-007514; DOE/PC-30142/T3) Avail: NTIS HC A02/MF A01

Desulfurization experiments have been carried out using the moving bed flow reactor to examine the following: (1) hardgrove grindability index of microwave treated coal compared with raw coal; (2) washability of microwave treated coal compared with raw coal; (3) the extent of sulfur and ash removal from alkali/coal treated samples. In the washability experiments, the following treatment sequence was carried out: expose raw coal (1-2 in size) to microwaves (2 kW power level, 120 to 240 sec exposure); crush (30 to 200 mesh); float/sink (1.6 S.G.). Sulfur, ash and CV measurements were made on the float fractions for comparison with similar measurements on raw coal samples prepared in the same way as microwave treated samples. Table 2 is a summary of the sulfur, ash and calorific value analyses comparing washed with raw coal samples. These data were used to calculate percent energy recovery as shown in the table. It is not possible to conclude from the data taken to date whether there is beneficiation from microwave treated-washed coal since two coals showed increased energy recovery and two did not. Additional washability data will be taken to pursue this question. DOE

N83-19855# Argonne National Lab., Ill.
ALKALI METAL VAPOR REMOVAL FROM PRESSURIZED FLUIDIZED-BED COMBUSTOR FLUE GAS Quarterly Report, Apr. - Jun. 1981
I. Johnson and S. H. D. Lee Nov. 1981 24 p refs
(Contract W-31-109-eng-38)
(DE82-007039; ANL/FE-81-50) Avail: NTIS HC A02/MF A01

This work supports the program to develop methods for the removal of gaseous alkali-metal compounds from the combustion gases from pressurized fluidized-bed coal combustors so as to minimize the corrosiveness of these gases toward the gas turbine. Results are presented on the study of activated bauxite as a granular-bed sorbent for the removal of gaseous NaCl from high-temperature, high-pressure simulated PFBC gases. In the studies reported, SO2 (approx 400 ppM) was added to the test gas mixture to more closely simulate combustion gas. A major fraction (approx 94%) of the alkali metal captured by the activated bauxite in the presence of SO2 was found to be water soluble. A significant amount of sulfate ion was found in the leachate, indicating the conversion of part of the adsorbed NaCl to sodium sulfate. When SO2 is not present in the test gas, about 75% of the sorbed sodium is water-soluble. The aluminate ion is the major anion in the leachate, indicating the conversion of part of the adsorbed NaCl to sodium aluminate. DOE

N83-19856# Ames Lab., Iowa.
DIRECT DETERMINATION OF ORGANIC SULFUR IN COAL WITH ESTIMATES OF INTRA- AND INTER-PARTICLE VARIATION
W. E. Straszheim and R. T. Greer (Iowa State Univ.) 1982 19 p refs Presented at Scanning Microscop. Conf., Anaheim, Calif., Apr. 1982 and AF/DARPA Rev. of Progr. in Quantitative NDE, Boulder, Colo., 2 Aug. 1981
(Contract W-7405-eng-82)
(DE82-014321; IS-M-373; CONF-810839-12; CONF-820409-4) Avail: NTIS HC A02/MF A01

Review of the literature indicates that ASTM methods of sulfur analysis for coal are quite susceptible to error due to insufficient HNO3 penetration and due to altered iron and sulfur chemistries in both raw and processed coals. The ASTM method does not directly determine the organic sulfur content of coal, but derives an organic sulfur estimate as the difference of total and mineral sulfur contents. Precision using such a scheme is reduced as uncertainty in the organic sulfur level represents the sum of the uncertainties in each of the other sulfur determinations. An electron beam analysis technique has been adapted for directly measuring organic sulfur levels in coal by analyzing a number of locations within several particles of the maceral vitrinite with an SEM/energy-dispersive X-ray analyzer system. Results using this technique afford stimation of the intra- and inter-prticle variation in organic sulfur level as well as an average organic sulfur value. DOE

N83-19857# Gulf Science and Technology Co., Pittsburgh, Pa. Chemical and Minerals Div.
EFFECTS OF COMPONENTS OF SYNFUELS ON SOOT FORMATION Quarterly Technical Progress Report, 1 Oct. - 31 Dec. 1981
Mar. 1982 57 p refs
(Contract DE-AC22-80PC-30307)
(DE82-012901; DOE/PC-30307/5; QTPR-5) Avail: NTIS HC A04/MF A01

The objective of this project is to test the effects of the chemical components of coal liquid fuels on soot formation using bench-scale premixed flat flames of the vaporized liquids. The cellular spatial flame inhomogeneities usually occurring in such flames were suppressed by a co-feed of ethylene. Model coal liquid components were tested. Pyridine produced no soot, in great contrast to toluene. To isolate various coal liquid components such as mono-, di-, and triaromatics, narrow boiling distillation fractions were collected with boiling midpoints between 180 and 650 F, and four fractions with boiling midpoints between 180 and 385 F were tested for sooting. The results showed trends of increasing soot yields with increasing aromatics content and boiling midpoints, but also exceptions which need more detailed testing. Compositional analyses of some fractions by mass spectrometry and capillary gas chromatography were also begun, and clarified the types of separations, chromatography, and spectrometry most needed for compositional data to correlate with the sooting results for the fractions. DOE

N83-19858# Battelle Columbus Labs., Ohio.
SYNTHETIC-FUEL AROMATICITY AND STAGED COMBUSTION Quarterly Progress Report, 1 Oct. - 31 Dec. 1981
A. Levy, J. R. Longanbach, and L. K. Chan 31 Jan. 1982 20 p refs
(Contract DE-AC22-80PC-30302)
(DE82-010302; DOE/PC-30302/5; QPR-5) Avail: NTIS

HC A02/MF A01

The objectives of the tasks are as follows: (1) determine the volatility and to characterize the aromatic and fuel-N compounds present in a typical synfuel; (2) determine the aromatic and fuel-N characteristics of narrow (50 C) distillation cuts of synfuel as a function of time, temperature and oxygen level; (3) determine the ease of oxidation of the pyrolysis products; (4) define the burning characteristics of synfuel as a function of equivalence ratio, temperature and residence time in two-stage combustion; (5) apply the results from Task 2, 3 and 4 into existing models for soot and NO/sub x/ formation in flames. Results obtained on total nitrogen analyses of the fuels and condensable products have been found to lack needed precision and accuracy. Test samples are currently being analyzed by a third laboratory. A similar series of test done to evaluate the titration method for the determination of basic nitrogen has shown excellent precision and accuracy. Pyrolysis and oxidative experiments have been extended to 1100 C ad the percent of stoichiometric oxygen to 70% of the oxygen required for complete combustion. DOE

N83-19859# West Virginia Univ., Morgantown. Dept. of Physics.

X-RAY DIFFRACTION AND SCATTERING STUDIES OF COAL CONSTITUENTS Semiannual Technical Progress Report, 1 Jul. - 31 Dec. 1981

A. S. Pavlovic and J. J. Renton 15 Jan. 1982 41 p refs

(Contract DE-FG22-80PC-30225)

(DE82-007991; DOE/PC-30225/T2) Avail: NTIS HC A03/MF A01

A procedure has been outlined wherein the positions and areas of the peaks of the Fourier transform of the halo pattern of coals are calibrated against known properties of the coals. It is shown that this calibration can be used to make a proximate analysis of unknown coals with results as good as the conventional methods. There are several advantages which this technique has over conventional techniques: (1) Sample preparation is simple; and (2) it can be performed quickly. It also offers the possibility of leading to more fundamental information about the structure of coal if the Fourier transform characteristics can be related to the structure of coal. Finally, this technique offers a means of characterizing and/or identifying other amorphous materials. DOE

N83-19860# Pennsylvania State Univ., University Park. Coal Research Section.

RELATIONSHIPS BETWEEN COAL CONSTITUTION, THERMOPLASTIC PROPERTIES AND LIQUEFACTION BEHAVIOR OF COALS AND VITRINITE CONCENTRATES FROM THE LOWER KITTANNING SEAM, PART 1 Final Report

J. T. Senftle and A. Davis Jan. 1982 240 p refs

(Contract DE-AC22-80PC-30013)

(DE82-012848; DOE/PC-30013/T2-Pt-1) Avail: NTIS HC A11/MF A01

The major objective of this study was to assemble a base of coal data in order to reveal systematic interrelationships among the chemical and petrographic compositions and the liquefaction behavior and thermoplastic properties of coal from a single coal seam. Trends in the lateral variability of carbon, hydrogen, nitrogen, oxygen, sulfur contents, volatile matter, ash yields, petrographic composition, and reflectance are presented. These trends in the composition and properties within a single coal seam enabled the areal changes in depositional environment and post-depositional metamorphic changes to be evaluated. The liquefaction behavior and thermoplastic properties of any coal would seem to be dependent upon the constitution of the parent coal; however, the petrographic, physical and chemical heterogeneity of coal and complexity of the liquefaction and thermoplasticity processes make a study of the interrelationships extremely difficult. Consequently, a complex statistical analysis of these variables has been used. DOE

N83-19861# TRW Defense and Space Systems Group, Redondo Beach, Calif. Fluid Thermochemistry Dept.

EFFECT OF RAPID-HEATING RATE ON COAL NITROGEN AND SULFUR RELEASE Quarterly Technical Progress Report, 19 Aug. - 19 Dec. 1981

N. Gat 28 Jan. 1982 48 p refs

(Contract DE-AC22-81PC-40273)

(DE82-010115; DOE/PC-40273/T1; QTPR-1) Avail: NTIS HC A03/MF A01

A laser pyrolysis technique is applied to the investigation of the effects of heating rate on release of coal-bound sulfur and nitrogen. Entrained coal particles flowing in an inert atmosphere are subjected to a high power laser beam. The rapid heating causes pyrolysis and subsequent release of volatile matter. Diagnostics have been developed to measure the particle temperature as a function of time in the laser beam. This measurement will give the heating rate of the coal particles. The interference of volatile matter with the spectroscopic measurements, through emission/absorption was eliminated. The experimental set up and the diagnostic techniques are described as well as the analysis by which the experimental data can be reduced to a useful engineering form. Following a general introduction, section 2 of the report describes the phenomenology of laser heating. The experimental set up including the diagnostics and instrumentation is described in detail in section 3. DOE

N83-19862# Exxon Research and Engineering Co., Florham Park, N.J.

EDS COAL-LIQUEFACTION PROCESS DEVELOPMENT, PHASE 5 Quarterly Progress Report, 1 Oct. - 31 Dec. 1981

Mar. 1982 312 p refs

(DE-FC01-77ET-10069)

(DE82-012444; DOE/ET-10069/T17; FE-2893-83) Avail: NTIS (US Sales Only) HC A14/MF A01; DOE Depository Libraries

Operation of the recycle liquefaction units and the coal liquefaction pilot plant with various coals is reported giving yields and product data. Solvent hydrogenation studies at low process pressure (900 psig) showed that the severity of hydrogenation at these conditions decreased in agreement with the model of hydrogenation. Combustion tests of coal-derived fuels were performed in a 1450 hp boiler. Fractionation and hydrogenation of coal liquids was carried out to prepare experimental gasoline blending stock and diesel fuels (with cetane improvers). Experiments involving radioactive tracers were carried out to get data on holdups, residence time and the degree of backmixing needed for plant engineering and design. Other operations are discussed briefly. (LTN) DOE

N83-19863# SRI International Corp., Menlo Park, Calif.

SOLVENT-REFINED-COAL (SRC) PROCESS: HEALTH PROGRAMS. VOLUME 3: PILOT PLANT DEVELOPMENT WORK. PART 4: INDUSTRIAL HYGIENE, CLINICAL AND TOXICOLOGICAL PROGRAMS Final Interim Report, 1 Aug. 1980 - 31 Mar. 1982

May 1982 216 p refs Prepared in cooperation with Pittsburg and Midway Coal Mining Co., Englewood, Colo.

(Contract DE-AC05-76ET-10104)

(DE82-013839; DOE/ET-10104/57-Vol-3-Pt-4; FIR-76-Vol-3-Pt-4; Res/Develop-Rept-53-Vol-3-Pt-4) Avail: NTIS HC A10/MF A01

The mutagenic studies conducted on solvent refined coal-2 materials are discussed. A Saccharomyces/Mammalian-microsome mutagenicity study, involved the use of a eukarvotic microorganism capable of detecting mitotic crossing-over. A dermal cytogenetics study in rats, concerned the analysis of cells from the bone marrow of rats dermally exposed to the test materials for the presence of chemically induced genetic alterations in chromosome number and structure. The unscheduled DNA synthesis in primary rat liver cell cultures, involved the evaluation of the capability of the test materials to induce damage to the DNA. The only positive mutagenic response to coal slurry and stripper tower bottoms was observed in the unscheduled DNA synthesis experiments. The only positive response to middle distillate was observed in the female animals in the dermal cytogenetics studies. DOE

N83-19864# Southern Services, Inc., Birmingham, Ala.

SRC-I SOLVENT REFINED COAL PROCESS

Mar. 1982 68 p refs
(Contract DE-AC22-76ET-10154)
(DE82-009161; DOE/ET-10154/99) Avail: NTIS HC A04/MF A01

During a fifteen month period at the Advanced Coal Liquefaction R & D Facility in Wilsonville, AL, a test program was conducted to evaluate a US Filter filtration unit. The vertical-leaf pressure filtration unit was used to remove ash and unreacted coal from the SRC unit process stream. This report describes the filtration unit and the modifications that were made to improve its performance. It also presents data relating to the operation of the unit and to filtration studies and analyses that were completed. DOE

N83-19865# Systems Science and Software, San Diego, Calif.
DYNAMIC SIMULATION OF SULFUR-REMOVAL SYSTEMS Final Report
J. H. Alexander, T. R. Blake, D. H. Brownell, Jr., W. D. Henline, and D. E. Wilkins Jan. 1982 104 p refs Sponsored by DOE
(DE82-902074; EPRI-AP-2187) Avail: NTIS HC A06/MF A01

A generalized computer simulation was developed to predict the dynamic response of alternate gas absorption systems for selective removal of sulfur compounds or ammonia from fuel gas or synthesis gas produced from coal or other fossil fuels. The models use numerical methods based upon finite difference techniques to determine the spatial distribution of process variables within both the absorption and regeneration columns of such gas cleanup processes. The simulator may be applied to systems for selective gas absorption based on either chemical or physical principles. Examples of such systems include the Benfield process based on absorption by chemical reaction with an activated alkali carbonate solvent, and the allied SELEXOL solvent process based on physical absorption as a result of partial pressure differences of the gas components above an organic solvent system. Simulations of either individual process units or an entire integrated plant can be performed. DOE

N83-19866# Department of Energy, Pittsburgh, Pa. Energy Technology Center.
FORMATION/DECOMPOSITION OF CONDENSIBLE HYDROCARBONS DURING THE GASIFICATION OF COAL
D. V. Nakles, J. P. Fillo, M. J. Massey, and J. P. Strakey Apr. 1982 65 p refs
(DE82-014493; DOE/PETC/TR-82/11) Avail: NTIS HC A04/MF A01

Production and composition of condensible hydrocarbons, commonly referred to as tars and oils, from the gasification of coal vary significantly with gasifer design and operation. Major process parameter such as gas-solid contacting, coal heating rates, reaction temperature, and product gas residence time influence both the initial formation and subsequent decomposition/reaction of hydrocarbons in the gasifier. The 4 inch diameter fluidized bed gasifier was used to segregate, quantitatively, the roles of formation/decomposition phenomena on the quantity and character of hydrocarbons produced during coal gasification. Specifically, production characteristics of both hydrocarbon condensates (i.e., tars and oils) and dissolved organics (mainly phenol) in the aqueous condensates were monitored while systematically varying process operating conditions. DOE

N83-19867# Princeton Univ., N. J. Dept. of Chemical Engineering.
SHORT-RESIDENCE-TIME HYDROPYROLYSIS OF COAL Progress Report
D. A. Saville and W. B. Russel 1982 24 p refs
(Contract DE-AC01-79ET-13153)
(DE82-013410; DOE/ET-13153/T8) Avail: NTIS HC A02/MF A01

Kinetic data on the rapid pyrolysis and hydrolysis of a second coal is presented. The influence of pressure reaction time, and temperature on the fluidity of devolatilizing coal particles was demonstrated. B.G.

N83-19868# Brigham Young Univ., Provo, Utah. Combustion Lab.
PREDICTION AND MEASUREMENT OF OPTIMUM OPERATING CONDITIONS FOR ENTRAINED COAL-GASIFICATION PROCESSES. VOLUME 2: USER'S MANUAL FOR A COMPUTER PROGRAM FOR 1-DIMENSIONAL COAL COMBUSTION OR GASIFICATION (1-DICOG) Final Report, 1 Nov. 1979 - 31 Dec. 1981
Philip J. Smith and J. Douglas Smoot Dec. 1981 328 p refs Sponsored in part by Electric Power Research Inst. 3 Vol.
(Contract DE-AC21-80MC-14380)
(DE82-015610; DOE/MC-14380/1210-Vol-2) Avail: NTIS HC A15/MF A01

A one dimensional, steady-state model describing pulverized coal combustion and gasification is presented. Emphasis was placed on the description of the coal reaction processes and gas-particl interactions, one dimensional fluid mechanics and particle-particle, particle-wall radiation were included as well. Moisture vaporization from the coal particles, multi-step coal pyrolysis, and heterogeneous char oxidation by multiple oxidizers are modeled for polydispersed coal particle sizes or types. Although the formulation is one dimensional, mixing rates of primary and secondary streams and recirculation within the reactor were accounted for as specified input. The resulting model predicts thermal, chemical, and physical histories for both the gaseous and particle phases. Gas-particle interactions account for appropriate diffusion and kinetic rates. Gas phase reactions are assumed to be in local chemical equilibrium. DOE

N83-19869# Brigham Young Univ., Provo, Utah. Combustion Lab.
PREDICTION AND MEASUREMENT OF OPTIMUM OPERATING CONDITIONS FOR ENTRAINED COAL-GASIFICATION PROCESSES. VOLUME 3: USER'S MANUAL FOR A COMPUTER PROGRAM FOR 2-DIMENSIONAL COAL GASIFICATION OR COMBUSTION (PCGC-2) Final Report, 1 Nov. 1979 - 31 Dec. 1981
Philip J. Smith and L. Douglas Smoot Dec. 1981 166 p refs Sponsored in part by Electric Power Research Inst. 3 Vol.
(Contract DE-AC21-80MC-14380)
(DE82-015611; DOE/MC-14380/1210-Vol-3) Avail: NTIS HC A08/MF A01

A two dimensional, steady-state model for describing pulverized coal combustion and gasification is presented. The model is applicable to cylindrical axi-symmetric systems. Turbulence is accounted for in both the fluid mechanics equations and the combustion scheme. Radiation from gases, wall, and particles is taken into account using a flux method. The particle phase is modeled in a Lagrangian framework so that individual paths of particles are followed. A two-step coal devolatilization scheme is used along with a heterogeneous reaction scheme that allows for both diffusion and chemical reaction. Gas-phase reactions are modeled assuming infinite rate kinetics, meaning that the reaction rates are limited by the turbulent rate of mixing. The gas phase is described by elliptic partial differential equations that are solved by an iterative line-by-line technique. Under-relaxation is used to achieve numerical stability. DOE

N83-19870# Utah Univ., Salt Lake City. Dept. of Mining and Fuels Engineering.
CHEMISTRY AND CATALYSIS OF COAL LIQUEFACTION: CATALYTIC AND THERMAL UPGRADING OF COAL LIQUID AND HYDROGENATION OF CO TO PRODUCE FUELS Quarterly Progress Report, Oct. - Dec. 1981
W. H. Wiser Mar. 1982 81 p refs
(Contract DE-AC22-79ET-14700)
(DE82-012474; DOE/ET-14700/9) Avail: NTIS HC A05/MF A01

Experiments on the upgrading of coal liquids by catalytic hydrogenation are reported. Catalysts, nuclear magnetic resonance and other related basic research are discussed. DOE

N83-19871# Oklahoma State Univ., Stillwater. School of Electrical Engineering.

CATALYSTS FOR UPGRADING COAL-DERIVED LIQUIDS Quarterly Report, 1 Jan. - 31 Mar. 1982
B. L. Crynes 15 Apr. 1982 48 p refs
(Contract DE-AC22-79ET-14876)
(DE82-013928; DOE/ET-14876/T5) Avail: NTIS HC A03/MF A01

Construction of a reactor system incorporating significant improvements was completed, and experimental run ZBF was initiated. This run is part of a set to evaluate reactor beds of zoned and differing catalysts. Only a single, large pore catalyst is presently under test. Catalyst support properties for hydrotreating an (SRC) solvent refined coal oil is predicted based on a parallel fouling model. The larger pore diameter catalysts with smaller pellet size not only provide lower diffusional resistances, but they can accommodate more coke while maintaining activity. Effects of titanocene dichloride addition to the feed stock on hydrotreatment indicate the following: (1) improved hydrotreatment catalyst activity while processing SRC-light oil; (2) reduction of coke content along the length of the catalyst bed; and (3) ease of the removal of the titanocene dichloride itself in the hydrotreatment operation. DOE

N83-19872# Transco Energy Co., Houston, Tex.
TRANSCO MEDIUM-Btu COAL GASIFICATION PROJECT: FEASIBILITY STUDY, VOLUME 1 Final Report
Mar. 1982 465 p 3 Vol.
(Contract DE-FG01-81RA-50381)
(DE82-009597; DOE/RA-50381/1156-Vol-1) Avail: NTIS HC A21/MF A01

The results of the preliminary facility design portion of Transco's overall feasibility study are given. The objective is to develop the conceptual design and cost estimate for a coal gasification plant producing medium-Btu fuel gas from Texas lignite. The preliminary plant design presented in utilizes commercially proven technology. Capital investment and operating costs were developed based on fourth quarter-1981 costs. No projection is included for escalation. The cost estimates for the selected process configuration are included. Also process alternative studies are summarized. DOE

N83-19873# Transco Energy Co., Houston, Tex.
TRANSCO MEDIUM-Btu COAL GASIFICATION PROJECT: FEASIBILITY STUDY, VOLUME 2 Final Report
Mar. 1982 573 p 3 Vol.
(Contract DE-FG01-81RA-50381)
(DE82-009596; DOE/RA-50381/1156-Vol-2) Avail: NTIS HC A24/MF A01

The economic analysis of a coal gasification production facility estimated a minimum constant real cost of medium Btu of $6.30/MMBtu. The most likely competitive fuels for the MBG are natural gas and low sulfur No. 6 fuel oil. Most forecasters now expect that deregulated gas prices existing by the time this plant could be producing MBG, 1989, will be priced competitively with low sulfur No. 6 fuel oil on a heating value basis at the burner tip. For this reason, the comparison presented is based on 1981 prices paid for low sulfur (0.7%) No. 6 fuel oil on the Gulf Coast. Average spot prices are used to remove distortions from old contracts. The average of the 1981 spot prices published in Platt's Oilgram for 0.7% sulfur No. 6 fuel oil in the Gulf Coast market was $5.13/MMBtu. Ignoring both the small unit costs for fuel oil transportation and the burner modifications required to use MBG, the MBG cost is 23% above the fuel oil average in 1981. DOE

N83-19874# Transco Energy Co., Houston, Tex.
TRANSCO MEDIUM-Btu COAL GASIFICATION PROJECT: FEASIBILITY STUDY, VOLUME 3 Final Report
Mar. 1982 537 p refs 3 Vol.
(Contract DE-FG01-81RA-50381)
(DE82-009595; DOE/RA-50381/1156-Vol-3) Avail: NTIS HC A23/MF A01

Environmental, health, safety and socio-economic assessments; a management plan; regulations in Texas for such plants; environmental effects of the associated gas pipeline; general equipment specifications; Lurgi process drawings; and permit application forms to be completed for a coal gasification plant are discussed. Burner modifications to go to intermediate Btu gas from natural gas and a list of plant species in the pipeline path are given. DOE

N83-19875# Institute of Gas Technology, Chicago, Ill.
COMBUSTION CHARACTERISTICS OF FINE-GROUND COAL Quarterly Technical Report, 1 Dec. 1981 - 28 Feb. 1982
Apr. 1982 20 p refs
(Contract DE-AC22-81PC-40269; Proj. 61052)
(DE82-012931; DOE/PC-40269/13) Avail: NTIS HC A02/MF A01

Research to investigate the effect of coal particle size on the flame characteristics of pulverized coal is discussed. The purpose is to determine if fine grinding will allow replacement of oil by coal in some industrial applications. Pulverized coal will be fired at about 2 million Btu per hr (approximately 160 lb per hr) in a special experimental furnace designed to collect data on the combustion and heat-transfer characteristics of flames. Combustion trials with No. 6 oil are also planned to allow for direct correlation with the coal combustion data. Some of the information to be obtained from this study will be a determination of how the flame heat release density, mass burning rate, flame temperatures, and heat-transfer characteristics change with fuel particle size (fineness of coal grinding). In addition, slagging behavior of the ash will be studied using a boiler's convective pass model and a special slagging probe. DOE

N83-19876# Sandia Labs., Albuquerque, N. Mex.
MULTIPLE-TRACER GAS ANALYZER
J. E. Uhl 1982 12 p refs Presented at Symp. on Instrumentation and Control for Fossil Energy Processes, Houston, Tex., 7 Jun. 1982
(Contract DE-AC04-76DP-00789)
(DE82-017032; SAND-82-0214C; CONF-820612-4) Avail: NTIS HC A02/MF A01

A multigas tracer system was designed, built, and used on an explosively fractured oil shale rubble bed. The hardware, software, and overall operation of the tracer system is discussed. This system is a field portable, self contained unit, which utilizes a mass spectrometer for gas analysis. The unit has a 20 channel sample port capability and is controlled by a desk top computer. The system is configured to provide a dynamic sensitivity range of up to six orders of magnitude. A roots blower is manifolded to the unit to provide continuous low in all sample lines. The continuous flow process allows representative samples as well as decreasing the time between each measurement. Typical multiplex cycle time to evaluate four unique gases is approximately 12 seconds. DOE

N83-19877# Sandia Labs., Albuquerque, N. Mex.
CONTROLLED SOURCE AUDIO-MAGNETOTELLURIC (CSMAT) RESISTIVITY MEASUREMENTS FOR IN-SITU COMBUSTION
J. R. Wayland, D. O. Lee, P. C. Montoya, and B. W. Marshall 1982 12 p refs Presented at the Ann. Heavy Oil Slush EOR Contractors Conf., San Francisco, 27 Jul. 1982
(Contract DE-AC04-76DP-00789)
(DE82-016398; SAND-82-1193C; CONF-820712-1) Avail: NTIS HC A02/MF A01

The resistivity changes of an oil bearing formation as a firefront sweeps through were investigated. This information is important to an understanding of the CSAMT apparent resistivity maps made of thermal fronts associated with enhanced oil recovery processes. Resistivity measurements were made in a combustion tube used to simulate in situ combustion recovery. It was found that the resistivity of the formation increased by two decades as the firefront passed through the medium. DOE

N83-19878# Oak Ridge National Lab., Tenn.
SEPARATION OF ALCOHOL-WATER MIXTURES USING SALTS
J. C. Card and L. M. Farrell Apr. 1982 54 p refs
(Contract W-7405-eng-26)
(DE82-013346; ORNL/MIT-338) Avail: NTIS HC A04/MF A01

Use of a salt (KF or Na2SO4) to induce phase separation of alcohol-water mixtures was investigated in three process flowsheets to compare operating and capital costs with a conventional distillation process. The process feed was the Clostridia fermentation product, composed of 98 wt % and 2 wt % solvents (70% 1-butanol, 27% 2-propanol, and 3% ethanol). The design basis was 150 x to the 6th power kg/y of solvents. Phase equilibria and tieline data were obtained. Three separation process designs were developed and compared by an incremental economic analysis (+-30%) with the conventional separation technique using distillation alone. The cost of salt recovery for recycle was found to be the critical feature. High capital and operating costs make recovery of salt by precipitation uneconomical; however, a separation scheme using multiple effect evaporation for salt recovery has comparable incremental capital costs and lower incremental operating costs than the conventional separation process. DOE

N83-19879# Kansas State Univ., Manhattan.
DIFFUSION FLAME STUDIES OF THE CHEMICAL AND PHYSICAL MECHANISMS OF SOOT FORMATION FROM AROMATIC AND SUBSTITUTED AROMATIC FUELS Progress Report, 15 Feb. 1981 - 15 Feb. 1982
T. W. Lester, J. F. Kerklin, and C. M. Sorensen Mar. 1982 22 p refs
(Contract DE-AC02-80ER-10677)
(DE82-009310; DOE/ER-10677/2) Avail: NTIS HC A02/MF A01

The development of photon correlation spectroscopy as a soot particle size measurement in flames was pursued. Using both slot diffusion flames doped with benzene and a wick diffusion flame burning kerosene, soot size distributions were determined as a function of height above the base of the flame. Of particular interest was the correct relationship between the particle diffusion coefficient and the particle diameter. Effort was also expanded in extraction of the higher moments of the size distribution from the scattered light spectra. DOE

N83-19880# United Technologies Research Center, East Hartford, Conn.
PARAMETRIC PERFORMANCE STUDIES ON FLUIDIZED-BED HEAT EXCHANGERS Quarterly Technical Progress Report, 1 Jan. - 31 Mar. 1982
Richard C. Stoeffler Apr. 1982 12 p refs
(Contract DE-AC22-81PC-40280)
(DE82-013775; DOE/PC-40280/T3; R-82-915729-11) Avail: NTIS HC A02/MF A01

The performance of single and multistage shallow fluidized beds for possible application to the recovery of heat from sources such as waste heat, and coal combustion or coal gasification are investigated. Tests are conducted to: (1) investigate the effects of fouling due to liquid condensate in the gas stream on fluidized bed heat exchanger performance, (2) investigate the performance of fluidized beds which are staged using baffle plates, and (3) investigate the effects of different heat exchanger surface geometries. Work progressed in fouling experiments of the fluidized bed heat exchanger using water injection into the inlet plenum. Results are summarized as follows: heat exchanger performance is seriously degraded when the dew point temperature exceeds the heat exchanger surface temperature. The performance decrease occurs as a result of particle adherence to the heat exchanger surface and not as a result of particle agglomeration. DOE

N83-19881# Illinois Univ., Urbana-Champaign. Dept. of Aeronautical and Astronautical Engineering.
FLAME ACCELERATION MECHANISMS UNDER CONDITIONS OF PARTIAL CONFINEMENT Annual Report, Feb. 1981 - Jan. 1982
Roger A. Strehlow, T. W. Gary Yip, and B. Ghaffarian Feb. 1982 34 p refs
(PB83-109884; GRI-81/0035; AR-1) Avail: NTIS HC A03/MF A01 CSCL 21D

Two channel apparatus were designed and constructed to study the flame acceleration effects of obstacles with simple geometries placed in a partially confined combustible cloud. Some preliminary experiments were performed. The highest flame speed observed was 7.38 m/sec. The data indicates that, with the appropriate obstacle configurations, higher flame speeds could be observed. The preliminary results also lead to the suspicion that a row of cars in a parking lot or trains could be very dangerous in case of a vapor cloud fire. GRA

N83-19882# National Materials Advisory Board, Washington, D.C.
CLASSIFICATION OF GASES, LIQUIDS, AND VOLATILE SOLIDS RELATIVE TO EXPLOSION-PROOF ELECTRICAL EQUIPMENT Final Report
Aug. 1982 347 p
(Contracts DOL-J-9-F-5-0070; PHS-NIOSH-210-78-0120)
(PB83-110148; NMAB-353-5) Avail: NTIS HC A15/MF A01 CSCL 07D

This report covers the classification of some 1500 gases, liquids, and highly volatile solids into groups according to Article 500 of the National Electrical Code. It represents considerable expansion of an earlier National Materials Advisory Board report (NMAB 353-1). Author (GRA)

N83-19883# Bend Research, Inc., Oreg.
DEVELOPMENT OF COMPOSITE HOLLOW FIBERS: PHASE 3 Final Report
W. C. Babcock, R. W. Baker, R. P. Barss, B. A. Kruse-Smith, and H. K. Lonsdale 15 Apr. 1982 39 p refs
(Contract DI-14-34-0001-0508)
(PB83-108068; W83-00267; OWRT-C-00154-D(0508)(1)) Avail: NTIS HC A03/MF A01 CSCL 07D

Previous work under this program to develop brackish water reverse osmosis modules that employ inside skinned composite hollow fibers, led to the development of polysulfone hollow fiber support membranes having a high burst pressure and suitable water permeability and to the demonstration of brackish water desalting capability for polyamide coated fibers. Further research was directed towards developing and testing modules containing 10 sq ft of membrane area. A number of such modules were prepared that rejected over 95% salt and had fluxes of about 10 gallons/sq ft at 400 pounds/sq in. and 0.5 weight-% NaCl. The fouling resistance of these modules was demonstrated in field tests on pond water that contained about 1000 parts per million of suspended solids. In one test, a module was used for 40 days with only coarse filtration (100 micron filter) as pretreatment, during which, no significant module fouling occurred. These modules were also used in a plating shop for renovation of nickel plating rinse waters. GRA

N83-19884# Gulf South Research Inst., New Orleans, La.
DEVELOPMENT OF NOVEL POROUS SUBSTRATES FOR ULTRAFILTRATION, DESALINATION AND WATER RECLAMATION, PART 3 Final Report
Israel Cabasso, Thomas C. Shen, Brenda L. Zimny, and Ralph J. LeBoeuf 13 May 1982 124 p refs
(Contract DI-14-34-0001-0523)
(PB83-108639; W83-00259; OWRT-C-00151-D(0523)(1)) Avail: NTIS HC A06/MF A01 CSCL 07A

The objective of this overall project was to develop novel porous supports which can be used to fabricate composite membranes for desalination and water reclamation by reverse osmosis. Two commercially-available polymers were integrated: poly (phenylene oxide) and ethyl cellulose. The former chemically modified to the desired porous support via common water coagulating techniques, was described previously. The development of the ethyl cellulose (ET) support is currently reported. Several attempts to prepare the asymmetric (salt-rejecting) membrane from ET had limited success, and was discontinued due to inferior performance and particulate contamination in the commercial grade ET polymer. The attractiveness of ET over cellulose acetate resides in its pendent ester linkages (stable over a wide pH range), much lower surface energy and hydrophilicity,

and, hence, the fine porous matrix prepared from ET via phase inversion by water coagulation does not collapse on drying. A variety of porous substrates were developed and studied. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N83-19885*# American Society of Metals, Metals Park, Ohio.
BINARY NICKEL ALLOY PHASE DIAGRAMS COMPILATION AND CRITICAL EVALUATION Status Report, Jun. 1982 - Feb. 1983
James Hontas 16 Mar. 1982 17 p refs
(Grant NAG3-302)
(NASA-CR-170016; NAS 1.26:170016) Avail: NTIS HC A02/MF A01 CSCL 11F

Equilibrium diagrams general features, intermediate phases, liquidus and solidus, terminal solid solutions, metastable phases, crystallography, and thermodynamics are covered. Author

N83-19886*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRICTION AND WEAR OF SOME FERROUS-BASE METALLIC GLASSES
Kazuhisa Miyoshi and Donald H. Buckley Washington 1983 24 p refs Proposed for presentation at the Joint Lubrication Conf., Hartford, Conn., 18-20 Oct. 1983; sponsored by American Society of Mechanical Engineers and American Society of Lubrication Engineers
(NASA-TM-83067; E-1502; NAS 1.15:83067) Avail: NTIS HC A02/MF A01 CSCL 11F

Sliding friction experiments, X-ray photoelectron spectroscopy (XPS) analysis, and electron microscopy and diffraction studies were conducted with ferrous base metallic glasses (amorphous alloys) in contact with aluminum oxide at temperatures to 750 C in a vacuum. Sliding friction experiments were also conducted in argon and air atmospheres. The results of the investigation indicate that the coefficient of friction increases with increasing temperature to 350 C in vacuum. The increase in friction is due to an increase in adhesion resulting from surface segregation of boric oxide and/or silicon oxide to the surface of the foil. Above 500 C the coefficient of friction decreased rapidly. The decrease correlates with the segregation of boron nitride to the surface. Contaminants can come from the bulk of the material to the surface upon heating and impart boric oxide and/or silicon oxide at 350 C and boron nitride above 500 C. The segregation of contaminants is responsible for the friction behavior. The amorphous alloys have superior wear resistance to crystalline 304 stainless steel. The relative concentrations of the various constituents at the surfaces of the amorphous alloys are very different from the nominal bulk compositions. Author

N83-19887*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BURNER RIG STUDY OF VARIABLES INVOLVED IN HOLE PLUGGING OF AIR COOLED TURBINE ENGINE VANES
Daniel L. Deadmore and Carl E. Lowell Feb. 1983 12 p refs
(NASA-TM-83308; E-1547; NAS 1.15:83308) Avail: NTIS HC A02/MF A01 CSCL 21E

The effects of combustion gas composition, flame temperatures, and cooling air mass flow on the plugging of film cooling holes by a Ca-Fe-P-containing deposit were investigated. The testing was performed on film-cooled vanes exposed to the combustion gases of an atmospheric Mach 0.3 burner rig. The extent of plugging was determined by measurement of the open hole area at the conclusion of the tests as well as continuous monitoring of some of the tests using stop-action photography. In general, as the P content increased, plugging rates also increased. The plugging was reduced by increasing flame temperature and cooling air mass flow rates. At times up to approximately 2 hours little plugging was observed. This apparent incubation period was followed by rapid plugging, reaching in several hours a maximum closure whose value depended on the conditions of the test. Author

N83-19888*# National Aeronautics and Space Administration, Washington, D. C.
A CORROSION CONTROL MANUAL FOR RAIL RAPID TRANSIT
Lloyd O. Gilbert, John F. Fitzgerald, II, and John T. Menke Mar. 1982 181 p refs
(Contract DOT-AT-70004)
(NASA-TM-85173; NAS 1.15:85173; UMTA-DC-06-0152-83-1; TR-26-2) Avail: NTIS HC A09/MF A01 CSCL 11F

In 1979, during the planning stage of the Metropolitan Dade County Transit System, the need was expressed for a corrosion control manual oriented to urban rapid transit system use. This manual responds to that need. The objective of the manual is to aid rail rapid transit agencies by providing practical solutions to selected corrosion problems. The scope of the manual encompasses corrosion problems of the facilities of rapid transit systems: structures and tracks, platforms and stations, power and signals, and cars. It also discusses stray electric current corrosion. Both design and maintenance solutions are provided for each problem. Also included are descriptions of the types of corrosion and their causes, descriptions of rapid transit properties, a list of corrosion control committees and NASA, DOD, and ASTM specifications and design criteria to which reference is made in the manual. A bibliography of papers and excerpts of reports and a glossary of frequency used terms are provided. Author

N83-19889*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ELEVATED TEMPERATURE BEHAVIOR OF SUPERPLASTICALLY FORMED/WELD-BRAZED TITANIUM COMPRESSION PANELS HAVING ADVANCED SHAPED STIFFENERS
Dick M. Royster and Thomas T. Bales Mar. 1983 29 p refs
(NASA-TP-2123; L-15547; NAS 1.60:2123) Avail: NTIS HC A03/MF A01 CSCL 11F

The 316 C (600 F) buckling behavior of superplastically formed/weld-brazed titanium compression panels having advanced shaped stiffeners was investigated. Fabrication of the advanced shaped stiffeners was made possible by the increased formability afforded by the superplasticity characteristics of the titanium alloy Ti-6Al-4V. Stiffeners having the configurations of a conventional hat, a beaded web, a modified beaded web, a ribbed web, and a stepped web were investigated. The data from the panel tests include load-shortening curves, local buckling strengths, and failure loads. The superplastic formed/weld-brazed panels with the ribbed web and stepped web stiffeners developed 25 and 27 percent higher buckling strengths at 316 C (600 F) than panels with conventionally shaped stiffeners. The buckling load reductions for panels tested at 316 C (600 F), compared with panels tested at room temperature, were in agreement with predictions based on titanium material property data. The advantage that higher buckling loads can be readily achieved by superplastically forming of advanced stiffener shapes was demonstrated. Application of these advanced stiffener shapes offers the potential to achieve substantial weight savings in aerospace vehicles. Author

N83-19890*# National Aeronautics and Space Administration. Pasadena Office, Calif.
PRODUCTION OF ULTRAPURE AMORPHOUS METALS UTILIZING ACOUSTIC COOLING Patent Application
Mark C. Lee, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 21 Dec. 1982 17 p
(Contract NAS7-100)
(NASA-Case-NPO-15658-1; US-Patent-Appl-SN-451896) Avail: NTIS HC A02/MF A01 CSCL 11F

Amorphous metals are produced by forming a molten unit of metal and deploying the unit into a bidirectional acoustical levitating field or by dropping the unit through a spheroidizing zone, a slow quenching zone, and a fast quenching zone in which the sphere

is rapidly cooled by a bidirectional jet stream created in the standing acoustic wave field produced between half cylindrical a acoustic driver and a focal reflector or a curved driver and a reflector. The cooling rate can be further augmented by first a cryogenic liquid collar and second a cryogenic liquid jacket surrounding the drop tower. The sphere is quenched to an amorphous solid which can survive impact in the unit collector or is retrieved by a vacuum chuck. NASA

N83-19891# Aerojet Liquid Rocket Co., Sacramento, Calif.
SINGLE PARTICLE IMPACT TESTING, ALTERNATE MATERIALS STUDY Final Technical Report
William B. Arnold Apr. 1982 39 p Prepared in cooperation with Effects Technology, Inc., Santa Barbara, Calif.
(Contracts F04704-80-C-0022; F04701-77-C-0130)
(AD-A121446; ALRC-3215-30; BMO-TR-82-36) Avail: NTIS HC A03/MF A01 CSCL 11/6

This technical report documents the single particle impact testing conducted as part of the alternate materials study task for Transpiration Cooled Nosetips (TCNT) on the Active Cooling Technology Development (ACTD) program. Single particle impact testing was conducted on two materials, pure Molybdenum and Molybdenum TZM. The data obtained was reduced to an erosion coefficient/temperature Cn (T), and compared to existing data for stainless steel. Hypervelocity impact testing was conducted on the two candidate TCNT materials. Author (GRA)

N83-19892# Westinghouse Research Labs., Pittsburgh, Pa.
TITANIUM PRODUCTION BY A PLASMA PROCESS Final Technical Report, 15 May 1980 - 15 Sep. 1981
M. G. Down Wright-Patterson AFB, Ohio AFWAL May 1982 68 p refs
(Contract F33615-80-C-5091; AF Proj. ILIR)
(AD-A121892; AFWAL-TR-82-4018; Rept-81-9B6-ARCTI-R3) Avail: NTIS HC A04/MF A01 CSCL 11/6

An initial feasibility study is described of a plasma process for the sodium reduction of titanium tetrachloride to produce pure titanium metal and its alloys. Theoretical, economic, and experimental studies have lead to the conclusion that such a process is highly promising and has the ability to replace conventional batch technology by a one-step continuous process with the potential for a higher purity product. Author (GRA)

N83-19893# Dayton Univ., Ohio.
MECHANICAL PROPERTY DATA ON P/M ALUMINUM X7091-T7E69 EXTRUSION Interim Report, Aug. 1981 - Jul. 1982
John J. Ruschau and Scott K. Jarvis (AF) Wright-Patterson AFB, Ohio AFWAL Oct. 1982 34 p refs
(Contract F33615-82-C-5039; AF Proj. 2421)
(AD-A121875; UDR-TR-82-99; AFWAL-TR-82-4161) Avail: NTIS HC A03/MF A01 CSCL 11/6

A mechanical property investigation was performed on aluminum X7091-T7E69 extrusion, a recently developed alloy produced using powder-metallurgy technology. Properties examined were tensile and compression, smooth and notched fatigue, fracture, fatigue crack growth, and stress corrosion cracking. For notched fatigue investigations, stress concentration factors as high as 10 were examined. Author (GRA)

N83-19894# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
AMORPHOUS IRON BORIDES: PREPARATION, STRUCTURE AND MAGNETIC PROPERTIES Final Report, Nov. 1978 - Jun. 1982
Kishin Moorjani 28 Sep. 1982 65 p refs
(Grant DRXRO-15344-P)
(AD-A120919; ARO-15344.6-PH) Avail: NTIS HC A04/MF A01 CSCL 11/6

Chemically and magnetically homogenous samples of amorphous iron-boron alloys over a wide concentration range have been fabricated and examined for their atomic and magnetic structures. The knowledge of homogeneity is important in obtaining controllable materials for defice applications, and the determination of atomic structure, distribution of magnetic oments and isomer shift is essential to the knowledge of chemical short-range order and the direction and amount of charge transfer. The details of these measurements along with their interpretation and formulation of theoretical models are described. GRA

N83-19895# Naval Ship Research and Development Center, Annapolis, Md. Ship Materials Engineering Dept.
CORROSION FATIGUE CRACK-GROWTH CHARACTERISTICS OF SEVERAL HY-100 STEEL WELDMENTS WITH CATHODIC PROTECTION
D. A. Davis and E. J. Czyryca Oct. 1982 35 p refs
(AD-A121424; DTNSRDC/SME-82/82) Avail: NTIS HC A03/MF A01 CSCL 11/6

The corrosion fatigue crack-growth properties of several types of HY-100 steel weldments were studied, primarily in an environment of seawater with cathodic protection by zinc anode. Shielded metal-arc and gas metal-arc of both pulsed and spray-arc processes, and submerged-arc weldments were included. The fatigue crack growth tests were conducted using compact specimens removed from the weldments to confine the path of the growing crack in all weld metal. Constant amplitude, sinusoidal loads were applied at a frequency of 0.17 hertz with a load ratio (minimum-to-maximum) of 0.10. In general, fatigue crack growth in weldments was considerably slower than that in HY-100 plate under the same conditions of load and environment, where the applied potential accelerated crack-growth rate. The results showed minor differences among the weldments. It was suggested that the residual stress along the weld center line, the inhomogeneity of the weld metal with respect to the crack path, defects, and minor porosity all act to retard crack growth, especially at lower stress intensity levels. These factors tend to mask the environmental effects. However, weldments prepared with high heat input showed greater resistance to fatigue crack propagation than weldments prepared at low heat input. GRA

N83-19896# Mettek Labs., Santa Ana, Calif.
EVALUATION OF THE RELATIVE HYDROGEN EMBRITTLEMENT SUSCEPTIBILITY OF ESR 4340 AND ITS HEAT TREAT DISTORTION PROPERTIES Final Report, 20 Apr. 1981 - 20 Jul. 1982
L. Raymond and C. Beneker (Parker-Hannifin Corp.) Watertown, Mass. Army Materials and Mechanics Research Center. Sep. 1982 58 p Presented at the Army Symp. on Critical Mech. Probl. in Systems Design, Cape Cod, Mass., 21-23 Sep. 1982
(Contract DAAG46-81-C-0045)
(AD-A122178; BERTEA-10103; AMMRC-TR-82-49; Rept-200712-3) Avail: NTIS HC A04/MF A01 CSCL 11/6

A test program to compare the relative hydrogen embrittlement susceptibility of remelted 4340 steel with ESR and VAR methods has been completed. The issue of ESR's susceptibility to hydrogen embrittlement arose when unexpected difficulties were experienced with critical control system actuator pistons on the helicopter programs. High strength (above 260 Ksi) 4340 ESR steel is used in these applications because of 4340 ESR's demonstrated superior ballistic tolerance. Three heat treat levels and two grain orientations were evaluated; and three test methods were applied to measure embrittlement susceptibility. A significant reduction in embrittlement susceptibility is associated with lower strength (approximately 43 HRC) as compared to high strength (approximately 53 HRC) 4340. The short transverse grain direction is more susceptible than the longitudinal direction, and all test methods indicated that VAR is less susceptible to hydrogen embrittlement than ESR. A parallel effort during the test program focused on heat treat distortion difference between ESR and VAR 4340. While a difference in distortion propensity cannot be ruled out on the basis of test results, it can be concluded that such differences between ESR and VAR are small compared to heat treatment parameters affecting distortion. Author (GRA)

N83-19897# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Materials Engineering.
ROLES OF RATE AND STATE OF STRESS IN CONTROLLING

SUSCEPTABILITY TO HYDROGEN EMBRITTLEMENT Annual Report
M. R. Louthan, Jr. and R. P. McNitt Oct. 1979 94 p refs
(Contract DE-AS05-76ET-26962)
(DE83-000354; DOE/ET-26962/T1) Avail: NTIS HC A05/MF A01

Interactions between stress, state, strain rate and type of hydrogen exposure (pre-charged, or environmental) were examined in a series of experiments with A106, 4340 and 4370 steel. Implications of the results to hydrogen transmission and storage systems show the difficulties inherent in the extrapolation of data from one stress-state-hydrogen system to different operating environments. The experiments included fracture mechanics measurements on compact tension A106 specimens tested in either hydrogen or oxygen gas, delayed failure tests of 4340 specimens stressed to either a biaxial or uniaxial surface stress via bending, burst testing of smooth and preflawed AISI 1015 specimens through the pressurization with either hydrogen or oxygen, sustained and cyclic loading of A106 tubular samples where the applied stress resulted from a combination of axial load and internal pressurization, and torsional fatigue of notched and smooth 4370 specimens in low pressure hydrogen gas. DOE

N83-19898# Sandia Labs., Albuquerque, N. Mex.
THERMAL-CONVECTIVE-LOOP CORRECTION TESTS OF 316SS AND IN800 IN MOLTEN NITRATE SALTS
R. W. Bradshaw Feb. 1982 31 p refs
(Contract DE-AC04-76DP-00789)
(DE82-012313; SAND-82-8210) Avail: NTIS HC A03/MF A01

The corrosion behavior of Type 316 stainless steel and Incoloy 800 in molten NaNO3-KNO3 was studied using thermal convection loops which operated between the temperature limits, 630 C to 350 C, for up to 4000 hours. Corrosion rates were approximately 1 mil/year at 600 C for 316SS but increased to about 4 mil/year at 630 C. Less extensive results are reported for IN800 but the corrosion rates appear to be similar to 316SS. Corrosion products consisted of the spinels, Fe3O4 and Fe(Fe,Cr) 2O4, at temperatures below 600 C, although NaFeO2 and Fe(Fe,Cr)2O4 were present at higher temperatures. In addition, internal oxide penetration was observed in IN800. Considerable spalling of surface scales was found at temperatures above 600 C and a mass balance was developed to estimate total corrosion rates from weight change and metallographic data. Chromium, but not iron or nickel, accumulated as a solute in the melt as a result of depletion from the alloys, but no thermal gradient mass transfer was detected. DOE

N83-19899# American Gas Association Labs., Cleveland, Ohio.
CORROSIVE EFFECTS OF FLUE GAS CONDENSATE Final Report, Apr. 1979 - Apr. 1982
D. W. DeWerth and A. M. Waters Jun. 1982 78 p refs Sponsored by Gas Research Inst.
(PB83-102350; GRI-81/0079) Avail: NTIS HC A05/MF A01 CSCL 11F

The amounts of NO2(-), NO3(-), and SO4(--) and the pH value of condensate generated from burning seven different near future pipeline gases are presented. The gases were burned with a low (0.25 grains/100 cu ft) and higher (1.0 grains/100 cu ft) level of sulfur in the gases. The major constituent of the condensate was found to be the nitrite ion (nitrous acid) and the pH value when collected over glass, or on a noncorrosive surface, varies from 3.4 to 3.8. If the condensate forms on a metal surface it may also contain metal ions, and the pH will be somewhat higher. The report presents the effect on the condensate of aging and contact with metals. A materials evaluation test rig is described which exposed 4 x 6 inch samples of material to condensate from a pulse combustion burner on a cyclic schedule. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N83-19900* National Aeronautics and Space Administration. Pasadena Office, Calif.
ELASTOMER COATED FILLER AND COMPOSITES THEREOF COMPRISING AT LEAST 60% BY WEIGHT OF A HYDRATED FILLER AND AN ELASTOMER CONTAINING AN ACID SUBSTITUENT Patent
William A. Mueller (JPL, California Inst. of Tech., Pasadena), John D. Ingham (JPL, California Inst. of Tech., Pasadena), and William W. Reilly, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 8 Feb. 1983 7 p Filed 11 Jan. 1980 Sponsored by NASA
(NASA-Case-NPO-14857-1; US-Patent-4,373,039; US-Patent-Appl-SN-158530; US-Patent-Class-523-205; US-Patent-Class-524-436; US-Patent-Class-524-437; US-Patent-Class-524-503; US-Patent-Class-524-564; US-Patent-Class-524-786) Avail: US Patent and Trademark Office CSCL 11C

The impact resistance of flame retardant composites, especially thermoplastic molding: compounds containing over 60% hydrated mineral filler such as Al(OH)3 or Mg(OH)2 as improved by coating the filler with 1 to 20% of an elastomer. The composite will fail by crazing or shearing rather than by brittle fracture. A well bonded elastomeric interphase resulted by utilizing acidic substituted resins such as ethyl-hexyl acrylate-acrylic acid copolymers which bond to and are cross-linked by the basic filler particles. Further improvement in impact resistance was provided by incorporating 1 to 10% of a resin fiber reinforcement such as polyvinyl alcohol fibers that decompose to yield at least 30% water when heated to decomposition temperature. Author

N83-19901*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SURFACE CHEMISTRY, FRICTION AND WEAR OF Ni-Zn AND Mn-Zn FERRITES IN CONTACT WITH METALS
Kazuhisa Miyoshi and Donald H. Buckley 1982 20 p refs Presented at the 7th Ann. Conf. on Composites and Advan. Ceram. Mater., Cocoa Beach, Fla., 16-20 Jan. 1983; sponsored by American Ceramic Society
(NASA-TM-83068; E-1503; NAS 1.15:83068) Avail: NTIS HC A02/MF A01 CSCL 11B

X-ray photoelectron and Auger electron spectroscopy analysis were used in sliding friction experiments. These experiments were conducted with hot-pressed polycrystalline Ni-Zn and Mn-Zn ferrites, and single-crystal Mn-Zn ferrite in contact with various transition metals at room temperature in both vacuum and argon. The results indicate that Ni2O3 and Fe3O4 were present on the Ni-Zn ferrite surface in addition to the nominal bulk constituents, while MnO2 and Fe3O4 were present on the Mn-Zn ferrite surface in addition to the nominal bulk constituents. The coefficients of friction for the ferrites in contact with metals were related to the relative chemical activity of these metals. The more active the metal, the higher is the coefficient of friction. The coefficients of friction for the ferrites were correlated with the free energy of formation of the lowest metal oxide. The interfacial bond can be regarded as a chemical bond between the metal atoms and the oxygen anions in the ferrite surfaces. The adsorption of oxygen on clean metal and ferrite does strengthen the metal-ferrite contact and increase the friction. The ferrites exhibit local cracking and fracture with sliding under adhesive conditions. All the metals transferred to he surfaces of the ferrites in sliding. Author

N83-19902*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SPECIMEN SIZE AND GEOMETRY EFFECTS ON FRACTURE TOUGHNESS OF Al2O3 MEASURED WITH SHORT ROD AND SHORT BAR CHEVRON-NOTCH SPECIMENS
John L. Shannon, Jr. and Dietrich G. Munz (Karlsruhe Univ.) 1983

14 p refs Proposed for presentation at the Symp. on Chevron-Notched Specimens: Testing and Stress Anal., Louisville, Ky., 21 Apr. 1983; sponsored by American Society for Testing and Materials
(NASA-TM-83319; E-1560; NAS 1.15:83319) Avail: NTIS HC A02/MF A01 CSCL 07C

Plane strain fracture toughness measurements were made on Al2O3 using short rod and short bar chevron notch specimens previously calibrated by the authors for their dimensionless stress intensity factor coefficients. The measured toughness varied systematically with variations in specimen size, proportions, and chevron notch angle apparently due to their influence on the amount of crack extension to maximum load (the measurement point). The toughness variations are explained in terms of a suspected rising R curve for the material tested, along with a discussion of an unavoidable imprecision in the calculation of K sub Ic for materials with rising R curves when tested with chevron notch specimens. Author

N83-19903# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INSULATION BONDING TEST SYSTEM Patent Application
Garland D. Johnston, Archie D. Coleman, Joseph N. Portwood, Jerry M. Saunders, John W. Redmon, and Allen C. Porter (Teledyne Brown Engineering Co., Huntsville, Ala.) Filed 10 Feb. 1983 19 p
(NASA-Case-MFS-25862-1; US-Patent-Appl-SN-465366) Avail: NTIS HC A02/MF A01 CSCL 11A

A method and a system for the bonding of foam insulation attached to metal is described. The system involves the use of an impacter which has a calibrated load cell mounted on a plunger and a hammer head mounted on the end of the plunger. When the impacter strikes the insulation at a point to be tested, the load cell measures the force of the impact and the precise time interval during which the hammer head is in contact with the insulation. This information is transmitted as an electrical signal to a load cell amplifier where the signal is conditioned and then transmitted to a Fast Fourier Transform (FFT) analyzer. The FFT analyzer produces energy spectral density curves (power plotted against frequency in Hertz) which are displayed on a video screen. NASA

N83-19904*# National Aeronautics and Space Administration. Pasadena Office, Calif.
ABSORBABLE SUSCEPTOR JOINING OF CERAMIC SURFACES Patent Application
James E. Schroeder (JPL, California Inst. of Tech., Pasadena) and Paul J. Shlichta, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 10 Feb. 1983 19 p
(Contract NAS7-100)
(NASA-Case-NPO-15640-1; US-Patent-Appl-SN-465367) Avail: NTIS HC A02/MF A01 CSCL 11B

An assembly of ceramic surfaces, particularly refractory metal oxides and carbides, abutting a thin sheet of metal susceptor material are placed in a chamber of an enclosure containing inert gas. An r.f. coil is activated by power supply to melt the susceptor and adjacent zones of the ceramic. Reactive gas such as oxygen or a carbonizing gas is then fed to the chamber and reacts with the susceptor to form compounds which disperse and dissolve in the zones. On cooling, a strong joint is formed. The susceptor may contain inner perforations and outer perforations to aid in distribution of heat. NASA

N83-19905# Ford Motor Co., Dearborn, Mich. Ceramic Materials Dept.
HIGH TEMPERATURE STRENGTH CHARACTERIZATION OF SINTERED ALPHA SILICON CARBIDE Progress Report, 1 Apr. 1980 - 31 Dec. 1981
R. K. Govila DOE Oct. 1982 83 p refs
(Contract DAAG46-77-C-0028)
(AD-A121437; AMMRC-TR-82-51) Avail: NTIS HC A05/MF A01 CSCL 11/2

Uniaxial tensile and flexural stress rupture testing of sintered alpha-SiC (Carborundum 1980 material) was carried out at 1200 to 1400 C in air at various applied stress levels and the corresponding times-to-failure were measured. Fractographic evidence from uniaxial tensile stress rupture testing at 1200 C revealed limited presence of slow crack growth associated with surface connected porosity failure sites. The extent of slow crack growth increased with increasing temperature and large regions of SCG were observed in tests made at 1300 C. These observations were supported by flexural stress rupture testing at 1300 and 1400 C. Slow crack growth is characterized primarily by intergranular crack propagation while fast fracture (brittle failure) occurs transgranularly. The uniaxial tensile stress rupture testing is much more sensitive in revealing the time-dependent crack growth behavior, especially at lower temperatures such as 1200 C in air, than flexural stress rupture testing. GRA

N83-19906# Westinghouse Research and Development Center, Pittsburgh, Pa. Polymers and Plastics Dept.
AGING STUDY OF AN ADHESIVE AND A PREPREG Final Report, 18 Sep. 1980 - 18 Dec. 1981
Z. N. Sanjana Feb. 1982 40 p refs
(Contract N00019-80-C-0596)
(AD-A121897) Avail: NTIS HC A03/MF A01 CSCL 11/1

This report provides data and results of studies performed on American Cyanamid's FM300 adhesive film aged under diverse conditions of temperature, time and humidity. At various times during the aging, physical properties of the adhesive were measured and the following methods were used to track the age of the adhesive: (1) dielectric analysis (DA), (2) dynamic mechanical analysis (DMA), and (3) a simple, easy to use time-temperature integrating device (TTW) which is carried with the material and provides a visual observation of the time and temperature exposure of the adhesive. It was found that DA, DMA, and the TTW can be used to follow the age of the adhesive and that they can be used as overage indicators to tell the user when the adhesive has lost its useful life. The indication by the TTW is less exact than by the other two methods. GRA

N83-19907# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
INVESTIGATION OF CHLORINE CONTAMINATION IN AIR FORCE MIL-H-5606 HYDRAULIC FLUID IN AIRCRAFT HYDRAULIC SYSTEMS Final Report, Feb. 1975 - Jun. 1980
C. E. Snyder, Jr., W. B. Campbell, W. J. Crawford, J. O. Gooding, L. J. Gschwender, E. King, G. J. Morris, G. J. Pavlik, and E. Wright Jun. 1982 53 p refs
(AF Proj. 2421)
(AD-A121882; AFWA-TR-82-4027) Avail: NTIS HC A04/MF A01 CSCL 11/8

It was determined that MIL-H-5606 aircraft hydraulic fluid, when contaminated with chlorinated cleaning solvents, can cause corrosion on hydraulic system components. This contamination in C-141 aircraft hydraulic systems was reduced by substituting P-D-680 petroleum distillate solvent for chlorinated cleaning solvents by technical order direction. A system sampling and flushing procedure during periodic depot maintenance (PDM) greatly reduced contamination. Maximum chlorine contamination limits of 55 ppm for new MIL-H-5606 hydraulic fluid and 200 ppm for the same fluid in Air Force aircraft were established. X-ray fluorescence spectroscopy as primary and gas liquid chromatography and microcoulometry as acceptable alternates were established as test methods to monitor the cholorine content of MIL-H-5606 aircraft hydraulic fluid. GRA

N83-19908# Oklahoma State Univ., Stillwater. Dept. of Chemistry.
MACROPROUS POLYMERIC SUPPORTS FOR ORGANIC SYNTHESIS Final Report, 1 Sep. 1979 - 31 Aug. 1982
Warren T. Ford 25 Oct. 1982 15 p refs
(Contract DAAG29-79-C-0195)
(AD-A120901; ARO-16527.7-CH) Avail: NTIS HC A02/MF A01 CSCL 07/3

Chemical reactions on insoluble polymer supports require

transport of reagents from solution into the cross-linked polymer matrix. Most previous polymeric reagents have employed 1-2% cross-linked polystyrene, which sells greatly in organic solvents. Such polystyrene gels, however, are weak mechanically, preventing their large scale application, and are unable to retard reactions between two polymer-bound species sufficiently to allow many site-isolation syntheses. Our research has been directed toward the use of more highly cross-linked polystyrene supports for organic synthesis. Examples include the generation and trapping of ester enolates by acylation and alkylation at room temperature (rather than the usual -78C) in high yield with no self-condensation of the ester, and effective Wittig olefin syntheses with macroporous supports having up to 20% cross-linking. Molecules as large as a 3-ketosteroid and a C19 aliphatic ketone are able to penetrate the 20% cross-linked polystyrene in Wittig syntheses. Transport of large organic molecules into reactive sites of the polymer succeeds in the presence of a good solvent when the polymer has been functionalized initially by a transport-sensitive chemical reaction. Author (GRA)

N83-19909# Rockwell International Corp., Thousand Oaks, Calif.
RESEARCH OF MICROSTRUCTURALLY DEVELOPED THOUGHENING MECHANISMS IN CERAMICS. PART 1: DETERMINATION OF RESIDUAL SURFACE STRESSES DUE TO GRINDING IN POLYCRYSTALLINE Al2O3. PART 2: FACTORS INFLUENCING THE RESIDUAL SURFACE STRESSES DUE TO A STRESS-INDUCED PHASE TRANSFORMATION. PART 3: COMPRESSIVE SURFACE STRENGTHENING OF BRITTLE MATERIALS. PART 4: TRANSFORMATION TOUGHENING: THERMODYNAMIC APPROACH TO PHASE RETENTION AND TOUGHENING Technical Report, 1 Jun. 1981 - 31 May 1982
F. F. Lange, M. R. James, and D. J. Green Oct. 1982 80 p refs
(Contract N00014-77-C-0441)
(AD-A120867; SC5117.13TR; SC5117.14TR; SC5117.15TR; SC5117.16TR; TR-13) Avail: NTIS HC A05/MF A01 CSCL 11/2

An X-ray diffraction technique has been used to measure the residual surface stresses induced by surface grinding in Al2O3 and in transformation-toughened Al2O3/ZrO2 composites. For the Al2O3, compressive stresses in the range 135 to 170 MPa were measured and were found to extend to a depth = 15 micron. It is believed that the compressive layer is produced by the elastic/plastic interaction of the abrasive grains with the ceramics. In the Al2O3/ZrO2 composites, comprehesive surface stresses are a result of the ZrO2 phase transformation, which is induced by the stresses during grinding. Residual compressive surfaces stresses up to approx. 1 GPa were measured. The role of the volume fraction of ZrO2, grain size and stabilizer oxide content in controlling the phase transformation are discussed, and their influence on the residual surface stress were measured. It was found that the volume fraction of ZrO2 primarily controlled the magnitude of the compressive surface stress, but that other factors such as grain size influenced the depth of the compressive zone. Finally, a fracture mechanics model is presented that allows the strengthening due to these residual stress to be predicted. The model, which allows for crack closure effects, showed that the strengthening depends on the ratio of the compressive zone depth to surface crack length, and on the strength of the material in the absence of residual stresses. Author (GRA)

N83-19910# Ceramic Finishing Co., State College, Pa.
LOCALIZED IMPACT DAMAGE IN CERAMICS Final Technical Report, 1 Feb. 1980 - 31 Aug. 1982
H. P. Kirchner, D. M. Richard, T. J. Larchuk, J. A. Tiracorda, and J. A. Ragosta 31 Aug. 1982 135 p refs
(Contract N00014-74-C-0241)
(AD-A120952;) Avail: NTIS HC A07/MF A01 CSCL 11/2

The following topics are covered in this report: Contact Damage in Hot Pressed and CVD Zinc Sulfide, Comparisons of Static and Impact Loading Damage in Zinc Sulfide, Load-Radial Crack Length Relations for Spherical Indentations in Hot Pressed ZnS, Elastic Recovery at Static Loading and Impact Indentations in MgF2, and Effect of Mechanical Impedance Ratio on the Distribution of Stress Wave Energy During Particle Impact. GRA

N83-19911# Naval Ocean Systems Center, San Diego, Calif.
TEMPERATURE EFFECTS IN CERAMIC RESONATORS CONTAINING CEMENT JOINTS Interim Technical Report, Oct. 1980 - Sep. 1981
C. L. Goodhart, G. L. Kinnison, C. I. Bohman, and G. W. Benthien Jun. 1982 31 p refs
(AD-A121946; NOSC-TR-716) Avail: NTIS HC A03/MF A01 CSCL 11/4

A temperature-related performance degradation has been discovered in ceramic stack 33-mode resonators that employ cement joints. This study sought to identify the mechanism that has produced this performance degradation and to determine resonator design improvements that eliminate or limit this degradation. A computer model of a typical ceramic stack resonator has been modified to include cement joints and has been used to simulate resonator in-air performance as a function of ceramic and cement-joint parameters. Experimental tests and initial modeling results indicate that temperature effects in the cement joints are the chief source of the resonator temperature-related performance degradation. The performance improvement that results from increased stress bias on the resonator during cement curing appears to be due to reduced amounts of cement in the joints. GRA

N83-19912# Naval Research Lab., Washington, D. C. Surface Chemistry Branch.
A KINETIC STUDY OF LUBRICANT ANTIOXIDANT DEPLETION IN AIRCRAFT GAS TURBINE ENGINES Interim Report
P. J. Sniegoski 17 Nov. 1982 16 p refs
(AD-A121431; NRL-MR-4958) Avail: NTIS HC A02/MF A01 CSCL 11/8

The kinetics of lubricant depletion in an aircraft gas turbine engine were treated as those of a stirred flow reactor. Depletion rates of p,p'-dioctylamine and phenyl-alpha-naphthylamine, based on zero and first order reaction models, were calculated. First order reaction rates most closely fit the engine test data. GRA

N83-19913# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
CHEMICAL ANALYSIS OF HYDROCARBON GREASE FROM SPIN BEARING TESTS
Reinhold Bauer, David J. Carre, and Paul D. Fleischauer 30 Sep. 1982 33 p refs
(Contract F04701-81-C-0082)
(AD-A122110; TR-0082(2945-03)-3; SD-TR-82-82) Avail: NTIS HC A03/MF A01 CSCL 11/8

The rotor bearing drag torque levels of certain spin bearing units were found to increase significantly during extended life testing. Samples of the greases from these tests were analyzed to determine if lubricant degradation was linked with the increased torque levels. By means of chromatographic and spectroscopic techniques, we were able to determine that oxidation of some of the greases had occurred and that the oxidative degradation was most easily observed in the soap thickener portion of the grease. GRA

N83-19914# Naval Air Engineering Center, Lakehurst, N.J. Support Equipment Engineering Dept.
OIL ANALYSIS
Peter B. Senholzi 23 Aug. 1982 499 p refs
(AD-A122156; NAEC-92-153) Avail: NTIS HC A21/MF A01 CSCL 11/8

The goal of the Oil Analysis Program was to place oil analysis on a firm technical basis. This goal was accomplished through an intensive experimental correlation effort relating wear debris characteristics to component surface wear condition. Such wear particle correlations served to highlight critical characteristics/parameters which reflect component surface wear condition. Component testing was conducted for ball bearings, roller bearings, gears, and pistons/cylinders. Respective test programs were

conducted by SKF Industries, Incorporated, the Naval Air Propulsion Test Center, and the Franklin Institute Research Laboratories. Test lubricant wear debris/particle analysis was conducted by SKF Industries, Incorporated, the Franklin Institute Research Laboratories, the National Bureau of Standards, Foxboro Analytical, and the Naval Air Engineering Center. Four critical wear debris/particle characteristics were identified under the test program and respective correlation effort. These parameters include particle quantity/concentration, size distribution, elemental composition, and morphology. The results of wear debris analysis compared to the physical examination of the component surface wear condition showed a good correlation in terms of monitoring the company's wear regime/condition throughout their respective wear life. GRA

N83-19915# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Polymer Branch.
THERMAL MECHANICAL ANALYSIS STUDY OF ACETYLENE TERMINATED QUINOXALINE RESINS Final Report, Mar. - Dec. 1981
C. Y.-C. Lee and E. J. Soloski (Dayton Univ.) Aug. 1982 27 p refs
(AF Proj. 2419)
(AD-A122195; AFWAL-TR-82-4049) Avail: NTIS HC A03/MF A01 CSCL 11/9

Additional cure effects of TMA (Thermal Mechanical Analysis), experiments are investigated and the results are compared with those from TICA (Torsion Impregnated Cloth Analysis) experiments. The penetration mode results are found to be more consistent and show similar behaviors between known Tg samples and isothermal cure samples. The expansion mode results may have been influenced by the physical aging effects and show different patterns between the two sets of samples. Because of the change in probe movement direction before and after the softening point in the penetration mode experiments, penetration mode results can highlight the additional cure effect more. Comparison with TICA results show, as expected, influence due to scanning rate.
Author (GRA)

N83-19916# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Polymer Branch.
TICA STUDY OF ATS-G Final Report, Jan. - Oct. 1981
C. C. Kuo and C. Y.-C. Lee Oct. 1982 34 p refs
(AF Proj. 2419)
(AD-A122313; AFWAL-TR-82-4037) Avail: NTIS HC A03/MF A01 CSCL 14/2

ATS-G resin was studied using the TICA technique. Effects of air and nitrogen cure environments were accessed and the results were compared with those from a previous study on BADABBA. In general, the findings are consistent with that reported in the previous study, indicating that the environmental effects on curing are inherent to all AT systems. The less thermally stable backbone structure of the sulfone groups led to observation of thermal degradation at high temperature which was not observed with the quinoxaline resin. Because of the lower glass transition temperature, the air effects in ATS-G are more clearly defined. The importance of air diffusion rate in determining the total air effect is shown in the study. Author (GRA)

N83-19917# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
GRADED-INDEX ANTIREFLECTIVE COATINGS FOR GLASS Final Report, Sep. 1978 - Feb. 1982
J. S. Haggerty Apr. 1982 181 p refs
(Contract DE-AC02-78ER-05003)
(DE82-016756; DOE/ER-05003/016; MIT-EL-82-016) Avail: NTIS HC A09/MF A01

Glass compositions and process conditions by which broad band graded-index antireflective films can be produced on glass surfaces have been developed. The end use for the treated glass sheet is as cover plates for flat plate solar-thermal collectors; thus, cost issues dictated that the process conditions fall within constraints imposed by the float glass process. To accomplish this objective, both the film formation process and the characteristics of the graded-index films were investigated in detail. A model borosilicate glass was used for initial work that served to verify experimental procedures, to confirm essential features of the film forming process and to determine whether the porous surface film and the phase separated structure of the host glass had an adverse effect on mechanical properties. Based on the results with the borosilicate glass, a candidate soda-lime-silica glass composition was defined that satisfied the phase separation and float glass process criteria. DOE

N83-19918# California Univ., Livermore. Lawrence Livermore Lab.
DESIGN METHODOLOGY FOR CUSHIONS
R. M. Christensen, W. W. Feng, and J. K. Lepper Mar. 1982 5 p refs
(Contract W-7405-eng-48)
(DE82-019263; UCID-19447) Avail: NTIS HC A02/MF A01

A procedure is developed whereby the porosity and the vinyl content in silicone vinyl content in silicone vinyl cushions can be predicted in order to meet a specified level of compressive deformation. Illustrative design examples are given and restrictions upon the method are discussed. DOE

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N83-19919# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Chemical Propulsion Information Agency.
ROUND ROBIN RESULTS OF THE CLOSED BOMB AND STRAND BURNER Final Survey Report
Arpad A. Juhasz, ed. (Ballistic Research Lab.) Jul. 1982 192 p refs
(Contract N00024-81-C-5301)
(AD-A120850; CPIA-Publ-361) Avail: Issuing Activity CSCL 21/9

A series of exercises was undertaken to assess the comparability of propellant burning rate data among installations. The study involved both the closed bomb and high pressure strand burner techniques. Identical propellant formulations were distributed, burned, and the data converted to burning rates. In some cases closed bomb as well as strand burner results showed excellent agreement (to + or - 2.5 percent on the average and to within + or - 1 percent mid-range). S.L.

N83-19920*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH PERFORMANCE LIQUID CHROMATOGRAPHIC HYDROCARBON GROUP-TYPE ANALYSES OF MID-DISTILLATES EMPLOYING FUEL-DERIVED FRACTIONS AS STANDARDS
Gary T. Seng and Dumas A. Otterson Mar. 1983 19 p refs
(NASA-TM-83072; E-1544; NAS 1.15:83072) Avail: NTIS HC A02/MF A01 CSCL 21D

Two high performance liquid chromatographic (HPLC) methods have been developed for the determination of saturates, olefins and aromatics in petroleum and shale derived mid-distillate fuels. In one method the fuel to be analyzed is reacted with sulfuric acid, to remove a substantial portion of the aromatics, which provides a reacted fuel fraction for use in group type quantitation. The second involves the removal of a substantial portion of the saturates fraction from the HPLC system to permit the determination of olefin concentrations as low as 0.3 volume percent, and to improve the accuracy and precision of olefins determinations. Each method was evaluated using model compound mixtures and real fuel samples. Author

N83-19921*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FUELS RESEARCH STUDIES AT NASA LEWIS

Albert C. Antoine 1982 19 p refs Presented at the 54th Ann. Conv. of the National Technical Association, Inc., Baltimore, 2-7 Aug. 1982
(NASA-TM-83003; E-1439; NAS 1.15:83003) Avail: NTIS HC A02/MF A01 CSCL 21D

Fuels research studies carried out in a variety of areas related to aviation propulsion, ground transportation, and stationary power generation systems are discussed. The major efforts are directed to studies on fuels for jet aircraft. These studies involve fuels preparation, fuels analysis, and fuel quality evaluations. The scope and direction of research activities in these areas is discussed, descriptions of Lewis capabilities and facilities given, and results of recent research efforts reported. Author

N83-19922# Southwest Research Inst., San Antonio, Tex. Mobile Energy Div.
DEGRADATION AND CHARACTERIZATION OF ANTIMISTING KEROSENE (AMK) Final Report, Jul. 1980 - Nov. 1981
R. J. Mannheimer Atlantic City, N.J. FAA Dec. 1982 86 p refs (Contract DOT-FA79WA-4310)
(MED-132; FAA-CT-82-93) Avail: NTIS HC A05/MF A01

Experiments are described which demonstrate the feasibility of degrading AMK in a single pass with a system consisting of a hydraulic fuel pump from a TF30 engine and several types of flow restrictors such as packed tubes or needle valves. The performance of the degraded AMK was evaluated with full-scale aircraft filters (JT8D and CF6), a T63 combustor and laboratory scale tests including filtration, ignition, and gel permeation chromatography. Rheological experiments indicated that while the shear viscosity of AMK increases above a critical shear rate, the magnitude of the shear viscosity is not large enough to explain the effectiveness of the FM-9 additive. However, it was shown that, associated with the critical shear rate, AMK exhibits strong viscoelastic effects that are not evident at low shear rates or in flow through an orifice. Author

N83-19923# Committee on Science and Technology (U. S. House).
THE SOCIOECONOMIC IMPACTS OF SYNTHETIC FUELS
Washington GPO 1982 331 p refs Hearing before the Subcomm. on Energy Develop. and Appl. of the Comm. on Sci. and Technol., 97th Congr., 2d Sess., 28 Apr. 1982
(GPO-98-702) Avail: Subcommittee on Energy Development and Applications

Federal assistance is needed for the development of synthetic fuels in order to convert natural resources to more usable energy forms. Various aspects of the synthetic fuels industry development are presented including oil shale extraction and proposals for five other projects. S.L.

N83-19924# Department of Energy, Bartlesville, Okla. Energy Technology Center.
MOTOR GASOLINES, SUMMER 1981
Ella Mae Shelton Apr. 1982 69 p refs
(DE82-014425; DOE/BETC/PPS-82/1) Avail: NTIS HC A04/MF A01

Samples were collected from service stations throughout the country and were analyzed in the laboratories of various refiners, motor manufacturers, and chemical companies. The analytical data for 715 samples of motor gasoline were submitted for study, necessary calculations and compilation. They represent the products of 33 companies, large and small, which manufacture and supply gasoline. These data are tabulated by groups according to brands (unlabeled) and grades for 17 marketing included in this report shows marketing districts into which the country is divided. A map included shows marketing areas, districts and sampling locations. Also included are charts indicating the trends of selected properties of motor fuels since 1959. DOE

N83-19925# Hodel (Gene E.), Roanoke, Ill.
ETHANOL PRODUCTION FROM CORN SCREENINGS Final Report
1982 11 p Sponsored by DOE
(DE82-012924; DOE/AF-92001/1) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The feasibility of on-farm production of ethanol from corn screenings is explored. A comparison of ethanol production from whole corn and screenings was done from an economic standpoint. The ethanol plant is described and illustrated. DOE

N83-19926# Denver Research Inst., Colo.
BLAST EFFECTS FROM CYLINDRICAL EXPLOSIVE CHARGES: EXPERIMENTAL MEASUREMENTS Final Report, Oct. 1979 - Dec. 1981
Myron N. Plooster China Lake, Calif. Naval Weapons Center Nov. 1982 229 p refs
(Contract N00123-79-C-0111; WF32300000)
(AD-A121863; NWC-TP-6382) Avail: NTIS HC A11/MF A01 CSCL 19/1

This report presents results of an experimental study of free-air blast wave properties for end-initiated cylindrical explosive charges. The study was motivated by the need for data on positive impulse form cylindrical charges, as a function of charge length/diameter (L/D) ratio, distance, and angle from the charge axis. Cast cylindrical charges of Pentolite were used, with L/D ratios of 1/4, 1/2, 1/1, 2/1, 3/1, 4/1, and 6/1. In all, 64 charges were fired: 54 8-pound cylinders, 4 16-pound cylinders, and 6 7/8-pound spheres (used for internal calibration purposes). For each shot, blast parameters were measured at two angles, 90-degrees apart, using six pressure gauges at each angle. Gauge arrays extended from 7 feet to 31 feet from the charge, covering a nominal pressure range of 100 psi down to 3 psi. Pressure-time plots from all guages on all shots are presented, together with measured values of peak pressure, positive impulse, positive duration, and time of arrival. Graphs of the variation of peak pressure and impulse with L/D ratio and angle are presented together with a comparison with spherical charge data. Substantial differences between blast waves from cylindrical and spherical charges are observed. Also presented are the results of scaling tests, an error analysis, and recommendations for further work.
Author (GRA)

N83-19927# Naval Surface Weapons Center, White Oak, Md.
SYNTHESIS OF ENERGETIC MATERIALS Annual Progress Report, 1981
H. G. Adolph, W. M. Koppes, D. A. Cichra, and M. E. Sitzmann 31 Mar. 1982 52 p refs
(AD-A121976; AD-F500074; NSWC/MP-82-214) Avail: NTIS HC A04/MF A01 CSCL 07/3

Several novel nitrodiols were synthesized and their reaction with formaldehyde to form poly- or cyclic formals was investigated. Polyformals prepared from 2,2,5,5-tetranitrohexanediol were characterized. Hexanitroperhydrodiazocine was synthesized and characterized. The synthesis of tetrazabicyclo(3.3.0)octane was initiated. GRA

N83-19928# Naval Surface Weapons Center, White Oak, Md. Energetic Materials Div.
THE DETONATION VELOCITY-LOADING DENSITY RELATION FOR SELECTED EXPLOSIVES AND MIXTURES OF EXPLOSIVES
Donna Price 26 Aug. 1982 31 p refs
(ZR0000101)
(AD-A121975; AD-F500075; NSWC/TR-82-298) Avail: NTIS HC A03/MF A01 CSCL 19/1

Recent detonation velocity (D) - loading density (Rho sub 0) data for pure explosives have been reviewed and preferred linear D-Rho sub 0 curves selected. The additivity law used was quite successful in both ranges with the exception of high porosity PETN mixtures. The Urizar method of prediction was satisfactory in the low porosity range, but unacceptable in the high porosity range for both pure and mixed high explosives (HE). The Kamlet method was satisfactory for 13 of 15 HE at Rho sub 0 = 1.6 g/cu cm and for 10 of 15 at Rho sub 0 = 1.0 g/cu cm. GRA

N83-19929*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

NON-STEADY COMBUSTION OF COMPOSITE SOLID PROPELLANTS Annual Research Progress Report, 1 Oct. 1980 - 31 Dec. 1981

N. S. Cohen and L. D. Strand Apr. 1982 28 p refs
(Grants NAS7-100; AF-AFOSR-0019-81; AF Proj. 2308)
(NASA-CR-169960; NAS 1.26:169960; AD-A118542; JPL-7000-7; AFOSR-82-0654TR) Avail: NTIS HC A03/MF A01 CSCL 21I

An analytical model for the pressure-coupled combustion response function was developed. Properties of the response function were calculated theoreticaly over a range of governing variables. The dependence of burn rate on AP concentration was found to be an important new combustion parameter in this context. Progress was made in devising experimental methods to characterize the heterogeneity of propellants in terms of fluctuations in the formulation and dynamic burning at constant pressure. Author

N83-19930# Naval Weapons Center, China Lake, Calif.

SYNTHESIS OF A NEW ENERGETIC MATERIAL, 1,4,5,8-TETRANITRO-1,4,5,8-TETRAAZADIFURAZANO-ECALIN (CL-15) Interim Report, Mar. 1981 - Jan. 1982

Rodney L. Willer Nov. 1982 35 p
(AD-A122049; NWC-TP-6397) Avail: NTIS HC A03/MF A01 CSCL 07/3

The synthesis and characterization of a new energetic material, 1,4,5,8-tetranitro-1,4,5,8-tetraazadifurazano (3,4-C) (3,4-H) decalin (CL-15) is described. The compound is calculated from its measured heat of formation and density to be the most eneregetic compound synthesized to date. Author (GRA)

N83-19931# Catholic Univ. of America, Washington, D.C. Vitreous State Lab.

MELTING POINT AND VISCOSITY BEHAVIOR OF HIGH ENERGY DENSITY MISSILE FUELS Final Report, 21 Dec. 1977 - 15 Dec. 1980

C. T. Moynihan, M. Shahriari, R. Mossadegh, M. Adel-Hadadi, and E. N. Boulos Wright-Patterson AFB, Ohio AFWAL Sep. 1982 54 p refs
(Contract F33615-78-C-2000)
(AD-A121799; AFWAL-TR-82-2025) Avail: NTIS HC A04/MF A01 CSCL 21/4

Three isomers of perhydrodi-(norbornadiene) (PHDNBD or RJ-5), the main component of the RJ-r and RJ-6 missile fuels, have been purified by recrystallizing the synthetic isomeric blends from acetone at dry ice temperature. The isomers have been designated HNN, HXX, and isomer I. HNN and HXX could be purified to 99.9% in three recrystallizations, out only 97% was reached with isomer I after thirteen recrystallizations. Melting points were measured by ASTM method D2386-67 as a function of composition for mixtures of the three RJ-5 isomers with themselves and with exotetrahydrodi(cyclopentadiene) (XTHDCPD or JP-10). HNN and HXX each have two crystalline forms. The solid-solid transitions between these two forms are sluggish, so that depending on thermal history or the type of crystal used to seed the melt, either form might crystallize and remelt on heating. Hence, most melts containing HNN and HXX as the main component could exhibit either of two melting points. Enthalpies of fusion and solid and liquid heat capacities were measured by DSC for HNN and HXX. Shear viscosities and densities were measured as a function of temperature (-55 to 50 C) and composition for mixtures of HNN, HXX and isomer I with XTHDCPD. There was very little difference among athe viscosity-composition isotherms for the three RJ-5 isomers. GRA

N83-19932# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.

DETERMINATION OF THE COMBUSTION MECHANISMS OF ALUMINIZED PROPELLANTS Annual Report, 1 Oct. 1981 - 31 Sep. 1982

J. P. Renie and J. R. Osborn 27 Oct. 1982 23 p refs
(Grant AF-AFOSR-3381-77; AF Proj. 2308)
(AD-A121692; AFOSR-82-0999TR) Avail: NTIS HC A02/MF A01 CSCL 21/2

This research project is concerned with determining the mechanisms governing the formation and combustion of metal/agglomerate/metal oxide particles throughout the solid rocket motor, that is, propellant surface/near surface, motor cavity, and nozzle regions. Also of concern is the influence these particles have on propellant combustion characteristics and overall motor performance. This part year's efforts have been directed toward developing the experimental equipment and/or techniques required for determining particle size distributions at or near the propellant surface. The approach taken involves making use of a laboratory scale, servo-controlled strand window bomb in conjunction with both an imaging-type particle size analyzer and a high speed, pulse-it photographic technique. In this report, the servo-controlled strand window bomb is described following a brief review of past research efforts have employed similar propellant feed mechanisms. Next, the theory and operation of the particle size analyzer is detailed. Finally, the feasibility of employing high speed, pulse-lit photography in the study of metal particle/agglomerate combustion is discussed. GRA

N83-19933# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Ballistic Research Lab.

WORKSHOP REPORT: COMBUSTION OF VERY HIGH BURNING RATE (VHBR) PROPELLANTS Final Report

Robert A. Fifer Nov. 1982 27 p refs Workshop held on 28-29 May 1981
(DA Proj. 1L1-62618-AH-80)
(AD-A121668; AD-F300124; ARBRL-TR-02441) Avail: NTIS HC A03/MF A01 CSCL 21/9

This report summarizes the results of a workshop dealing with the combustion behavior of certain materials which by virtue of their very high apparent burning rates are being considered for certain specialized applications requiring large flame propagation- or gas generation-rates. The workshop was sponsored by the Workshop Panel Committee of the JANNAF Combustion Subcommittee, and was held on 28-29 May 1981 in conjunction with the JANNAF Propulsion Meeting. This report was presented at the 18th JANNAF Combustion Meeting in October 1981, and published in the proceedings of that meeting. GRA

N83-19934# Naval Research Lab., Washington, D. C. Atmospheric Physics Branch.

SIZE DISTRIBUTIONS OF PYROTECHNICALLY GENERATED HYGROSCOPIC AEROSOLS Interim Report

W. A. Hoppel and G. M. Frick 19 Nov. 1982 30 p refs
(AD-A121695; NRL-4946) Avail: NTIS HC A03/MF A01 CSCL 17/4

Measurements of the size distribution and solubility were made on pyrotechnically generated, alkali-halide smokes in a 600 cubic meter environmental chamber. Detailed size distributions are presented and show that the mean size increased as the payload increased. A discussion of the aerosol formation process and growth of particles by recondensation of pyrotechnic material is also presented. GRA

N83-19935# Ballistic Research Labs., Aberdeen Proving Ground, Md.

FORM-FUNCTIONS FOR THE IBHVG CODE

Franz R. Lynn Nov. 1982 52 p refs
(DA Proj. 1L1-62618-AH-80)
(AD-A121669; ARBRL-TR-02438) Avail: NTIS HC A04/MF A01 CSCL 19/4

The form-functions, methods of calculating the mass fraction burned given the depth burned, are developed for the ten propellant grain geometries available in the IBHVG code, a frequently used interior ballistic computer program. The FORTRAN coding embodying the computations is included. Author

N83-19936# Michigan Univ., Ann Arbor. Dept. of Aerospace Engineering.

DETONATION CHARACTERISTICS OF SOME DUSTS AND LIQUID-DUST SUSPENSIONS Annual Report, 1 Mar. 1981 - 1 May 1982

C. W. Kauffman, J. A. Nicholls, M. Sichel, P. Lee, and K. Wood Jul. 1982 21 p refs
(Grant AF-AFOSR-0093-79; AF Proj. 2308)
(AD-A122296; UM-016968-3; AFOSR-82-1026TR) Avail: NTIS HC A02/MF A01 CSCL 19/4

This report presents progress on a study of the detonation properties of high explosive dusts when dispersed in air and suspended in liquids. The experimental facility is a modified form of a shock tube wherein the dust is blown through the tube and then a strong shock wave is transmitted into the heterogeneous mixture. The main objective of this research is to determine the detonation characteristics of dusts when dispersed in air under unconfined conditions. Important factors which bear on this problem, and hence which could be investigated, include the properties of the dust, the concentration of the dust, the size of the dust particles, the effects of excess oxygen, the energy of the initiating source, and the structure of the reaction zone. For a range of conditions, then, it is desirable to determine the pressure history within and behind the reaction zone, the wave velocity, the ignition time delay of the particles behind the leading shock wave, and to obtain high speed streak and framing photographs of the wave and reaction zone. The experimental results would be utilized in connection with an analytical treatment to develop a model for the initiation of such detonations. An interesting ramification of this research is the three-phase detonation. That is, the detonability aspects of dust particles entrained in liquid fuel droplets. GRA

N83-19937# Department of Energy, Bartlesville, Okla. Energy Technology Center.
LIQUID FOSSIL-FUEL TECHNOLOGY Quarterly Technical Progress Report, Apr. - Jun. 1982
Bill Linville, ed. and David Fuqua, ed. Oct. 1982 94 p refs
(DE83-002501; DOE/BETC/QPR-82/2) Avail: NTIS HC A05/MF A01

This report primarily covers in-house oil, gas, and synfuel research and lists the contracted research. The report is broken into the following areas: liquid fossil fuel cycle, extraction, processing, utilization, and project integration and technology transfer. BETC publications are listed. DOE

N83-19938# California Univ., Livermore. Lawrence Livermore Lab.
ZEOLITE ENCAPSULATION OF H2
S. Cooper and J. F. Lakner Aug. 1982 38 p refs
(Contract W-7405-eng-48)
(DE83-002611; UCRL-53312) Avail: NTIS HC A03/MF A01

Experiments with H2 have shown that it is possible to encapsulate gases in the structure of certain molecular sieves. This method offers a better means of temporarily storing and disposing of tritium. The method also proves safer, and enables isotope separation, and removal of He3. Initial experiments were performed with H2 to screen potential candidates for use with tritium. DOE

N83-19939# Department of Energy, Pittsburgh, Pa. Energy Technology Center.
TRANSPORT CHARACTERISTICS OF ALTERNATE SLURRY FUELS Quarterly Technical Progress Report, Jan. - Mar. 1982
1982 21 p refs
(DE82-013508; DOE/NBM-2013508) Avail: NTIS HC A02/MF A01

The transport and handling characteristics of coal-water mixtures (CWM) ranging in coal concentration from 58 to 65% by weight were evaluated. Tests were conducted in a flow loop designed to simulate fuel handling systems typical of industrial boiler applications. The flow system is instrumented to measure line pressure, pressure drop, temperature, and fuel flow rate at a number of points. For the upper limit of the flow rates and for the Pittsburgh steam coal used in these tests, these conditions would represent an average thermal input of roughly 70 x 10 to the 6th power Btu/h. Difficulties encountered in preparing the mixtures are discussed, as are time dependent changes in the effectiveness of the dispersing agents utilized. No attempt was made to prepare specially tailored particle size distributions that might increase the amount of coal in the mixture while maintaining the fluidity of the CWM. Results of the flow tests to date demonstrate the benefits to be gained from the use of dispersants. DOE

N83-19940# Air Products and Chemicals, Inc., Allentown, Pa.
LIQUID-PHASE METHANOL PROCESS DEVELOPMENT UNIT: INSTALLATION, OPERATION, AND SUPPORT STUDIES Technical Progress Report, 1 Jan. - 31 Mar. 1982
E. P. Holley, J. Klosek, I. C. Spector, and R. L. Mednick (Chem Systems, Inc., Tarrytown, N.Y.) 20 Apr. 1982 159 p refs
(Contract DE-AC22-81PC-30019)
(DE82-012725; DOE/PC-30019/T2; TPR-2) Avail: NTIS HC A08/MF A01

Approval was obtained for the unified design concept, advanced schedule for relocation of the LPM pilot plant, and advanced procurement of long lead delivery equipment items. The LaPorte LPMeOH PDU Process Flowsheet was developed further and the Engineering Flowsheet evolved to the Revision OA preliminary issue. Eight cases of point-by-point heat and mass balances were released. Process equipment specifications were issued for 30 of the 32 equipment items. Mechanical specifications were issued for 16 equipment items. Quotations were received for the 2 long lead delivery items, the Feed/Recycle engineeringompressor and the Slurry Circulation Pumps, technical evaluations of these bids are underway. Semi-final equipment arrangement and plot plan drawings were prepared. The Preliminary Hazards Review was conducted and the subsequent Design Hazards Review was initiated. Progress was made on the specification of the Data Acquisition System. APCI established the priority for compositions of new methanol powder catalysts to be prepared. DOE

N83-19941# Institute of Gas Technology, Chicago, Ill.
PIPELINE GAS FROM COAL: HYDROGENATION (IGT HYDROGASIFICATION PROCESS) Final Report, 1 Jul. 1976 - 31 Aug. 1980
Mar. 1982 565 p refs
(Contracts DE-AC01-76ET-10163; EF-77-C-012434)
(DE82-014611; DOE/ET-10163/68; FE-2434-68) Avail: NTIS HC A24/MF A01

The HYGAS coal gasification program was successfully concluded on August 31, 1980. This report covers operations under US Department of Energy Contract EF-77-C-012434 from July 1, 1976, through August 31, 1980. The primary objective was to provide pilot plant operating data for the design of a commercial/demonstration plant by Procon, Inc., (under a separate DOE contract) and to test process feasibility with a wide variety of bituminous coals. A total of 34 tests were conducted in the pilot plant. A major improvement in reactant gas distribution in the high-temperature steam-oxygen gasifier provided better mixing, more uniform temperatures, and higher carbon conversions without sintering. Commercial/demonstration design support was an integral part of the program. Anticipating the need for actual design data, IGT initiated a program to support the demonstration plant design effort with appropriate pilot plant operating data, technical assistance, data analysis, and process modeling and cold-flow modeling studies of selected areas of the commercial/demonstration plant design. Specific tasks completed under this part of the program are described. DOE

N83-19942# Rockwell International Corp., Canoga Park, Calif. Environmental and Energy Systems Div.
COAL-HYDROGASIFICATION PROCESS DEVELOPMENT Quarterly Progress Report, 1 Oct. - 1 Dec. 1981
L. P. Combs, D. Heister, and E. T. Lee Jan. 1982 38 p refs
(Contract DE-AC01-78ET-10328)
(DE82-007664; DOE/ET/10328-39) Avail: NTIS HC A03/MF A01

Principal activities related to the 3/4-TPH IPDU facility concerned ongoing receipt and acceptance test monitoring of advance procured components are discussed. Also continued were engineering liaison contacts with suppliers of advance procured

components experiencing technical and manufacturing problems such as the lock hopper valves to be used in the coal and char systems and the letdown valves. Previously ordered equipment continued to be received. Updating of the IPDU test facility design and general construction bid package was completed in preparation for soliciting bids from construction subcontractors. Startup of the microprocessor was accomplished; checkout of the data highways and final system diagnostics is scheduled for January 1982. All information generated by Rockwell Engineering to support the configuration of the microprocessor by Beckman has been completed. Beckman is scheduled to complete the analog portion of the configuration and download it into the Rockwell IPDU unit in January 1982, with final system configuration acceptance testing to follow. DOE

N83-19943# Decision Focus, Inc., Palo Alto, Calif.
INTEGRATED FORECASTING MODEL SYNTHETIC FUELS STUDY. VOLUME 1: OVERVIEW AND FINDINGS Final Report
R. A. Marshalla Apr. 1982 161 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 1108-1-4)
(DE82-903574; EPRI/EA-2358-Vol-1) Avail: NTIS HC A08/MF A01

The future of a synthetic fuels industry in the United States, with particular emphasis on the consequences for the electric power industry, is assessed. The assessment is based on use of the Integrated Forecasting Model (IFM), a technology based integrated system model of the national energy economy. A series of model scenarios was structured around three key uncertainties bearing on the future of synthetic fuels: synfuels process costs, imported oil prices, and system inertia (an aggregate representation of the effects of institutional and other factors on the maximum rate of market penetration of a new technology once it becomes economically attractive). DOE

N83-19944# Illinois State Univ., Normal.
ENERGY-EFFICIENT ALCOHOL-FUEL PRODUCTION Technical Final Report
Jan. 1982 15 p
(Contract DE-FG02-81AF-92006)
(DE82-011278; DOE/AF-92006/T1) Avail: NTIS HC A02/MF A01

The proposed utilization schedule for the alcohol fuel plant and methane generator is to produce 180 proof ethanol during the spring, summer, and fall (April to October). The ethanol will be used in the farm tractors and trucks during the planting, growing, and harvesting seasons. Some alcohol can be stored for use during the winter. The still will not be operated during the winter (November to March) when the methane from the digester will be used to replace fuel oil for heating a swine farrowing building. There are tentative plans to develop a larger methane generator, which will utilize all of the manure (dairy, beef, horses, and swine) produced on the ISU farm. If this project is completed, there will be enough methane to produce all of the alcohol fuel needed to operate all of the farm equipment, heat the buildings, and possibly generate electricity for the farm. The methane generating system developed is working so well that there is a great deal of interest in expanding the project to where it could utilize all of the livestock waste on the farm for methane production. DOE

N83-19945# Oak Ridge National Lab., Tenn. Fossil Energy Information Center.
PUBLICATIONS IN LIFE SCIENCES SYNTHETIC FUELS OF OAK RIDGE NATIONAL LABORATORY
L. W. Rickert, comp. Oct. 1982 55 p refs
(Contract W-7405-eng-26)
(DE83-001701; ORNL/TM-7680-S1) Avail: NTIS HC A04/MF A01

The list represents the principal elements of the Life Sciences Synthetic Fuels Program, namely: (1) characterization, measuring, and monitoring research to develop sampling and analytical techniques and surveillance instrumentation; (2) industrial hygiene efforts to identify and monitor potential health hazards to employees; (3) biological studies centered on the identification and screening of potentially hazardous materials and assessment of dose-response relationships for chronic or acute exposures; (4) environmental transport analyses to investigate material dispersion, reconcentration, and impact on biological communities; (5) environmental control research to develop techniques for effluent and emission reduction; and (6) assessments concerned with optimizing plant siting and operation through development and applications of methods for risk analysis. Publications are listed by author and in a permuted title index. DOE

N83-19946# Institute of Gas Technology, Chicago, Ill.
GASIFICATION OF LAND-BASED BIOMASS Annual Report, Jan. - Dec. 1981
D. E. Jerger, Henry S. Ghosh, D. Q. Tran, and S. Babu Sep. 1982 204 p refs
(PB83-109918; GRI-81/0080) Avail: NTIS HC A10/MF A01 CSCL 21D

Research to develop efficient processes for conversion of land-based biomass to methane and other resources is described. One activity involved screening a variety of species to evaluate their reactivity under conditions of biological and thermal gasification. The second activity included advanced biogasification experiments on water hyacinth/sludge blend to optimize methane yields, production rates, and process stability through pretreatment and advanced reactor configurations designed to increase solids and microbial residence times. An anaerobic biogasification potential bioassay was refined and applied to several herbaceous and woody species. Methane yields in the range of 4-6 SCF/1b VS added were obtained for most herbaceous and several woody species. These yields are substantially higher than reported previously for conventional digestion of these feeds. Of several pretreatment techniques evaluated, sodium hydroxide treatment resulted in improved methane yields with cotton gin trash and improved rates with cotton gin trash and woody species. GRA

N83-20238# Centre National d'Etudes Spatiales, Toulouse (France).
THE ARIANE LAUNCH VEHICLE PYROTECHNIC SYSTEMS: A DESIGN METHODOLOGY BASED ON RELIABILITY AND SAFETY ANALYSIS [SYSTEMES PYROTECHNIQUES DU LANCEUR ARIANE: UNE METHODOLOGIE DE CONCEPTION BASEE SUR UNE ANALYSE DE LA FIABILITE ET DE LA SECURITE]
J.-P. Bouloumie *In* ESA Reliability and Maintainability Sep. 1982 p 431-436 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N83-19947* National Aeronautics and Space Administration. Pasadena Office, Calif.
THIN WIRE POINTING METHOD Patent
Gordon Green (JPL, California Inst. of Tech., Pasadena) and Robert J. Mattauch, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 1 Mar. 1983 4 p Filed 17 Nov. 1981 Supersedes N82-24426 (20 - 15, p 2078) Sponsored by NASA (NASA-Case-NPO-15789-1; US-Patent-4,375,396; US-Patent-Appl-SN-322316; US-Patent-Class-204-129.55; US-Patent-Class-204-129.75) Avail: US Patent and Trademark Office CSCL 13I

A method is described for forming sharp tips on thin wires, in particular phosphor bronze wires of diameters such as one-thousandth inch used to contact micron size Schottky barrier diodes, which enables close control of tip shape and which avoids the use of highly toxic solutions. The method includes dipping an

end of a phosphor bronze wire into a dilute solution of sulfamic acid and applying a current through the wire to electrochemically etch it. The humidity in the room is controlled to a level of less than 50%, and the voltage applied between the wire and another electrode in the solutions is a half wave rectified voltage. The current through the wire is monitored, and the process is stopped when the current falls to a predetermined low level.

Official Gazette of the U.S. Patent and Trademark Office

N83-19948# Committee on Science and Technology (U. S. House).
STATUS OF METRIC CONVERSION IN THE US AND OVERSIGHT OF US METRIC BOARD
Washington GPO 1983 303 p Hearing before the Subcomm. on Sci., Res. and Technol. of the Comm. on Sci. and Technol., 97th Congr., 2d Sess., 8 Feb. 1982
(GPO-92-641) Avail: Subcommittee on Science, Research and Technology

The status and trends of metric conversion, and the success of the U.S. Metric Board in carrying out the statutory functions assigned to it under law are investigated. The impact of a dual system of weights and measures; the effects on productivity and rate of technological innovation; the effects of such a dual system in the schools, and on consumers; and the effects on the international trade situation are discussed. S.L.

N83-19949*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
JOINING LEAD WIRES TO THIN PLATINUM ALLOY FILMS Patent Application
John S. Przybyszewski (Pratt and Whitney Aircraft Group, East Hartford, Conn.) and Richard G. Claing, inventors (to NASA) (Pratt and Whitney Aircraft Group, East Hartford, Conn.) Filed 4 Dec. 1980 14 p
(Contract NAS3-20768)
(NASA-Case-LEW-13934-1; US-Patent-Appl-SN-212949) Avail: NTIS HC A02/MF A01 CSCL 13H

Disclosed is a two-step process of joining a lead wire to a 2 x 1/10 to the 6th power m thick platinum alloy film which rests upon an equally thin alumina insulating layer which is adhered to a metal substrate. Typically the platinum alloy film forms part of a thermocouple for measuring the surface temperature of a gas turbine airfoil. In the first step the lead wire is deformed 30 to 60% at room temperature while the characteristic 10 to the 6th power ohm resistance of the alumina insulating layer is monitored for degradation. In the second step the cold pressed assembly is heated at 865 to 1025 C for 4 to 75 hr in air. During the heating step any degradation of insulating layer resistance may be reversed, provided the resistance was not decreased below 100 ohm in the cold pressing. NASA

N83-19950# AIA Research Corp., Washington, D. C.
NEW DESIGN CONCEPTS FOR ENERGY-CONSERVING BUILDINGS. RESULTS OF A NATIONAL COMPETITION AMONG STUDENTS IN SCHOOLS OF ARCHITECTURE
1982 120 p
(Contract DE-AC01-76CS-18458)
(DE82-013319; DOE/CS-28458/T1) Avail: NTIS (US Sales Only) HC A06/MF A01; DOE Depository Libraries

The National Student Competition in Energy Conscious Design held among professional schools of architecture in 1976 is documented. Fifty-five schools participated, submitting 115 entries; twelve were chosen as finalists. Details are presented on the twelve winning designs and excerpts from the remaining 103 entries are published. DOE

N83-19951# Missouri Univ., Rolla. Dept. of Engineering Mechanics.
ABSTRACTS, 19TH ANNUAL MEETING SOCIETY OF ENGINEERING SCIENCE, INC.
Oct. 1982 371 p refs Meeting held in Rolla, Mo., 27-29 Oct. 1982
(Grant N00014-82-G-0055)
(AD-A121920) Avail: NTIS HC A16/MF A01 CSCL 05/2

The focal point of the activities of the Society of Engineering Science is its annual technical meeting. The technical program of this meeting consists of 48 sessions in which 330 papers are scheduled for presentation. This book contains the abstracts of these papers. GRA

N83-19952# Naval Research Lab., Washington, D. C.
EFFICIENT ELASTIC-PLASTIC DESIGN OF SMALL FOUNDATIONS
George J. OHara and Patrick F. Cunniff 22 Sep. 1982 29 p refs
(SF43400001)
(AD-A121693; AD-E000508; NRL-MR-4918) Avail: NTIS HC A03/MF A01 CSCL 13/13

An elastic plastic design analysis method is presented for small foundations which utilizes an energy criterion to insure against large deflections or unwanted collapse. The interaction effects from direct loads and shears are included, which has the effect of predicting a carrying capacity somewhat less than that of ordinary limit analysis. The energy storage capacity is calculated in a fashion which is conservative since the reduction of the planar moments of inertia is ignored. Several examples are worked out which use various beam like structures to illustrate the enhancement of carrying capacity from the sections contribution and of the indeterminate structural reactions. The results are worked up in detail, both theoretically and by numerical examples to show the ease of application and efficiency of this method. GRA

N83-19953# Hahn Associates, Northborough, Mass.
FEASIBILITY STUDY ON CNC MULTIOPERATION GRINDING OF JET ENGINE COMPONENTS USING FORCE SENSING ADAPTIVE CONTROL Final Report, 1 Apr. - 30 Sep. 1982
Robert S. Hahn 30 Sep. 1982 89 p refs
(Contract F49620-82-C-0066; AF Proj. 2305)
(AD-A121725; AFOSR-82-0992TR) Avail: NTIS HC A05/MF A01 CSCL 13/8

This report describes methods for reducing costs in grinding jet engine components using computer control with grinding force sensors to obtain improved grinding performance. Multioperation grinding using two wheelheads on the same cross slide as well as on separate slides is discussed. A method for eliminating thermal size errors is presented. Formulas are given for estimating grinding cycles, stock removal rates and wheelwear rates for both normal workspeed grinding and creep feed grinding. The computer, with the force sensors, can monitor differential wheelwear and thereby prevent form errors. Wheel sharpness can also be monitored to avoid thermal damage. Author (GRA)

N83-19954# Naval Ship Research and Development Center, Bethesda, Md. Structures Dept.
DESIGN, FABRICATION, AND STRUCTURAL EVALUATION OF AN ADVANCED COMPOSITE HYDROFOIL CONTROL FLAP Final Report
William P. Couch Nov. 1982 52 p refs
(SF43400391; NR Proj. 173-035)
(AD-A122235; DTNSRDC-82/072) Avail: NTIS HC A04/MF A01 CSCL 13/10

A hydrofoil control flap was designed and fabricated by the Boeing Company under contract to the Naval Sea System Command. It consisted of two graphite epoxy-titanium clad skins bolted and bonded to a titanium crank-spar assembly. It was tested statically at the Boeing Company to calibrate the response of electrical-resistance strain gages to strip loads; installed on the aft inboard foil of the hydrofoil PCH-1 (HIGH POINT) to demonstrate the ability of the composite to withstand the hydrofoil environment and to obtain service loads information; and tested in the laboratory at the David W. Taylor Naval Ship Research and Development Center to demonstrate its compliance with a four times-design-life capability. After being instrumental with 52 strain gages and calibrated for gage response as a function of applied load, the flap was installed on PCH-1. The flap remained on the boat for 26 months, but only saw 18 hours of foilborne operations due to unrelated mechanical difficulty with PCH-1. The 18 hours were

dedicated to calm-water trials. Although the flap performed satisfactorily, attempts to relate composite material strains to flap pressure loads proved unsuccessful due to the complex nature of the flap loading, the flap's structural geometry, and the loss of the majority of strain gages just prior to trails data collection. The flap was then prepared for cyclic testing in the Structural Evaluation Laboratory, but failed during the initial static test because of an overload caused by a malfunction of the control system.
Author (GRA)

N83-19955# Sandia Labs., Albuquerque, N. Mex. Applied Mechanics Div.
SMOOTHLY WANING, SYMMETRICALLY EXPANDING, CAVITY-PRESSURE LOADS IN EARTH MATERIALS
T. G. Priddy Jan. 1982 76 p refs
(Contract DE-AC04-76DP-00789)
(DE82-010932; SAND-81-2054) Avail: NTIS HC A05/MF A01

An approximate solution for the pressure loading required to expand a spherical cavity in rock and soil targets is derived. A dual characterization of fracture and flow material model is used. Frictional resistance to flow is also included. Nonlinear volumetric strain hardening is modeled with bilinear curves and unloading is assumed to be nondilative. Applications of this solution form to the prediction of pressure loading on slender, convex-nosed earth penetrators and on spherically nosed water entry vehicles are discussed. DOE

N83-19956# General Electric Co., Philadelphia, Pa. Energy Systems and Technology Div.
ANALYSIS AND DESIGN OF RESIDENTIAL LOAD CENTERS. VOLUME 2: APPENDICES Final Report
E. M. Mehalick, R. Lamders, G. OBrien, G. F. Tully, and J. Parker Mar. 1982 88 p refs
(Contract DE-AC04-76DP-00789)
(DE82-014253; SAND-80-7017-Vol-2) Avail: NTIS HC A05/MF A01

These three appendices present information on residential load center classification information. Emphasis is given to: residential development trends and residential housing classifications; detached house site layout alternatives; and legal and institional issues, including condominium ownership, commercial ownership of photovoltaic systems in mobile homes, and utility ownership of photovoltaic systems. DOE

N83-19957# Department of Energy, Washington, D. C. Office of Consumption Data System.
TECHNICAL DOCUMENTATION FOR THE NONRESIDENTIAL-BUILDINGS ENERGY-CONSUMPTION SURVEY, 1979 - 1980, BUILDING CHARACTERISTICS, ENERGY END USE AND FUEL OIL TANK DATA, PUBLIC USE DATA TAPES: USERS' GUIDE
Feb. 1982 224 p refs
(DE82-012523; DOE/EIA-0327) Avail: NTIS HC A10/MF A01

Basic information and technical specifications necessary for using machine readable magnetic tapes containing the building characteristics, energy end use and fuel oil tank data Nonresidential Buildings Energy Consumption Survey (NBECS) are provided. Included in this document are a brief overview of the NBECS, technical specifications for reading the tapes and descriptions of the contents of each of the files contained on the tape. The remaining sections are devoted to technical topics of special interest to users of the data. Appended to this document are copies of the questionnaire used in the survey, a listing of the contents of the SPSS labels file, COBOL file description and TPL codebook. DOE

N83-19958# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
GEOTHERMAL DEICING OF HIGHWAYS AND BRIDGE STRUCTURES
Ivar A. Engen Feb. 1982 14 p
(Contract DE-AC07-76ID-01570)
(DE82-012202; EGG-GTH-5739) Avail: NTIS HC A02/MF A01

Deicing of highways and bridge structures is discussed. Preliminary cost estimates were prepared for the Colorado Department of Highways. DOE

N83-19959# National Center for Resource Recovery, Washington, D. C.
CONSIDERATIONS IN SELECTING CONVEYORS FOR SOLID WASTE APPLICATIONS
Zahid Kahn, Marc L. Renard, and Jay Campbell Sep. 1982 134 p refs
(Grant EPA-R-806709)
(PB83-107482; EPA-600/2-82-082) Avail: NTIS HC A07/MF A01 CSCL 13B

An engineering evaluation and experimental program involving several types of conveyors applied to processed fractions of municipal solid wastes was conducted. The properties and characteristics of waste affecting conveyability are discussed and experimentally determined values or observed characteristics are presented. A procedure is developed for the selection, assessment and operation of belt conveyors based on spillage rate. Corroborating experimental results from a recirculating test rig operated with six waste fractions over a range of belt configurations, velocities and flow rates are presented. Experiments conducted on a vibrating pan conveyor with six feedstocks and over a range of frequencies and stroke length, and on a small apron conveyor (batch basis on two feedstocks), are described and the test results analyzed.
GRA

N83-19960# General Accounting Office, Washington, D. C. Community and Economic Development Div.
RUNWAYS AT SMALL AIRPORTS ARE DETERIORATING BECAUSE OF DEFERRED MAINTENANCE: ACTION NEEDED BY FAA AND THE CONGRESS
13 Sep. 1982 32 p
(PB83-105171; GAO/CED-82-104) Avail: NTIS HC A03/MF A01 CSCL 13B

Runways at many small airports are deteriorating faster than necessary because airport owners--usually local governments--have deferred critical maintenance. The result is damage to the runways' basic structure and a shortened useful life if they are not repaired. Based on GAO's review of 46 airports, studies by others, and the views of FAA officials, deferred maintenance is apparently a longstanding nationwide problem. Lack of funds is cited by airport owners as the primary reason for not performing needed maintenance; however, the Federal Aviation Administration's apathy to bring about satisfactory maintenance is a contributing cause. GAO is recommending actions that FAA can take to help ensure that runways at small airports are properly maintained. The Congress should recognize the airport owners' lack of resources to properly maintain airports when considering future revisions to the Airport Improvement Program. GRA

N83-19961# Transportation Research Board, Washington, D.C.
STRENGTH AND DEFORMATION CHARACTERISTICS OF PAVEMENTS
James F. Shook, Bernard F. Kallas, B. Frank McCullough, Arthur Taute, Gonzalo Rada, Matthew W. Witczak, J. S. Heisey, K. H. Stokoe, A. H. Meyer, Mario S. Huffman et al 1982 77 p refs
(PB83-107391; TRB/TRR-852; ISSN-0-309-03356-X;
LC-82-14449; ISSN-0361-1981) Avail: NTIS HC A04/MF A01 CSCL 13B

The Colorado experimental base project was a full-scale field experment constructed with various thicknesses of two full depth hot mix sand asphalt beans, one full depth asphalt concrete base, and one thickness of a standard design with untreated base and subbase layers. Relative thicknesses of one asphalt concrete base, two hot mix sand asphalt bases, and one standard design with untreated base and subbase required to give an equal level of pavement performance were determined. Certain measured properties of the pavement and the pavement components were related to observed levels of performance by using both empirical and theoretical models for pavement behavior. GRA

N83-19962# Swedish Council for Building Research, Stockholm.
SURVEY OF THE INTERNATIONAL DEVELOPMENT IN INDOOR CLIMATE CONTROL
Bengt Levin 1982 85 p refs
(PB83-100461; ISBN-91-540-3709-3; D8:1982) Avail: NTIS HC A05/MF A01 CSCL 13A

A survey of research in indoor climate control is presented. There are a number of research projects concerning improvement of HVAC-unit control. Only projects concerning the improvment of automatic control were selected. GRA

N83-19963# AiResearch Mfg. Co., Torrance, Calif.
SOLAR/GAS BRAYTON/RANKINE CYCLE HEAT PUMP ASSESSMENT Final Report, Apr. 1981 - May 1982
J. Rousseau and A. Y. Liu May 1982 102 p
(PB83-102319; GRI-80/0138) Avail: NTIS HC A06/MF A01 CSCL 13A

A 10-ton gas-fired heat pump is currently under development at AiResearch under joint DOE and GRI sponsorship. This heat pump features a highly efficient, recuperated, subatmospheric Brayton-cycle engine which drives the centrifugal compressor of a reversible vapor compression heat pump. The investigations under this program were concerned initially with the integration of this machine with a parabolic dish-type solar collector. Computer models were developed to accurately describe the performance of the heat pump packaged in this fashion. The study determined that (1) only a small portion (20 to 50 percent) of the available solar energy could be used because of a fundamental mismatch between the heating and cooling demand and the availability of solar energy, and (2) the simple pay back period, by comparison to the baseline non-solar gas-fired heat pump, was unacceptable (15 to 36 years). GRA

N83-19964# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
A SET OF SHELL FINITE ELEMENTS FOR DYNAMIC ANALYSIS OF COOLING TOWERS
T. Y. Yang and Rakesh K. Kapania 10 Jun. 1982 71 p refs
(Grant NSF CEE-80-24883)
(PB83-100990; NSF/CEE-82026) Avail: NTIS HC A04/MF A01 CSCL 13B

A set of shell finite elements is adopted, modified, or extended to study the dynamic responses of complex, thin shell structures and column-supported cooling towers due to earthquake excitation and wind loads. The elements are formulated to achieve optimum finite element modeling of the column-supported cooling towers according to the distributions of dominating bending and membrane stresses, and to model the vulnerable shell column region using discrete column elements and quadrilateral shell elements. Examples are provided to evaluate a single type, combined types and the whole set of elements. The whole set of elements is used to determine the first three eccentric natural frequencies of a column-supported cooling tower. The mean stresses and displacements in a fixed base cooling tower are determined and the results are found to be in excellent agreement with the known alternative solutions. Author (GRA)

N83-19965# National Bureau of Standards, Washington, D.C. Engineering Lab.
FLOW INDUCED BY FIRE IN A COMPARTMENT
K. D. Steckler, J. G. Quintiere, and W. J. Rinkinen Sep. 1982 104 p refs
(PB83-107714; NBSIR-82-2520) Avail: NTIS HC A06/MF A01 CSCL 13L

Fifty-five full scale steady state experiments were conducted to study the flow induced by a simulated pool fire in a compartment under conditions characteristic of the developing fire. The mass flow rate through the door or window opening and bounds on the fire plume entrainment rate are presented as a function of opening geometry, fire strength, and fire location. GRA

N83-19966# Norges Tekniske Hoegskole, Trondheim. Forskningsinstitutet for Cement og Betong.
TRANSVERSE COMPRESSION STRENGTH OF HEAVILY REINFORCED CONCRETE
Richard G. Anderson 1981 24 p
(PB83-100511; STF65-A81022) Avail: NTIS HC A02/MF A01 CSCL 13B

The static and fatigue strength of 150 x 150 x 450 mm concrete prisms with heavy concentrations of reinforcement placed transverse to the direction of applied load is compared to the strength of plain concrete prisms. Of eight patterns tested, only one is found to have a detrimental effect on the crushing strength. Results of specimens subjected to repeated loads are similar to those loaded monotonically. Confining reinforcement parallel to the axis compression should be placed outside such transverse reinforcement where this problem is encountered in practice. GRA

N83-19967# Massachusetts Inst. of Tech., Cambridge. Sea Grant Coll. Program.
ANALYSIS OF PERMANENT DISPLACEMENT FROM CYCLIC LOADING OF FOUNDATIONS
Alfredo M. Urzua and W. Allen Marr Jul. 1982 346 p refs
(Grant NA79AA-D-00101)
(PB83-113753; MITSG-81-9; NOAA-82080609) Avail: NTIS HC A15/MF A01 CSCL 13B

A linear viscoelastic formulation with parameters from stress path type tests promises a rational means to predict permanent displacements from drained cyclic loading with sufficient accuracy for most practical purposes. The finite element program, CYPEDE, gives an analytical procedure to calculate these permanent displacements. In the one dimensional case permanent strains predicted with the model using parameters from triaxial tests agree with measured strains, both in magnitude and rate. Predicted horizontal stress considerably exceeds the measured horizontal stress. In evaluating the formulation for two dimensional conditions the pattern and mechanism of displacement appear reasonable based on three series of analysis. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N83-19968* National Aeronautics and Space Administration. Pasadena Office, Calif.
CLUTTER FREE SYNTHETIC APERTURE RADAR CORRELATOR Patent
Atul Jain (JPL, California Inst. of Tech., Pasadena) Issued 8 Dec. 1977 4 p Filed 8 Dec. 1977 Supersedes N78-118266 (16 - 09, p 1142) Sponsored by NASA
(NASA-Case-NPO-14035-1; US-Patent-4,371,873; US-Patent-Appl-SN-858767; US-Patent-Class-343-9PS; US-Patent-Class-343-5CM; US-Patent-Class-343-100CL) Avail: US Patent and Trademark Office CSCL 17I

A synthetic aperture radar correlation system including a moving diffuser located at the image plane of a radar processor is described. The output of the moving diffuser is supplied to a lens whose impulse response is at least as wide as that of the overall processing system. A significant reduction in clutter results is given. Official Gazette of the U.S. Patent and Trademark Office

N83-19969*# National Aeronautics and Space Administration. Pasadena Office, Calif.
BEAM FORMING NETWORK Patent Application
Paul W. Cramer, Jr., inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 7 Dec. 1982 20 p
(Contract NAS7-100)
(NASA-Case-NPO-15743-1; US-Patent-Appl-SN-448441) Avail: NTIS HC A02/MF A01 CSCL 09C

A feed element to beam interconnection network is provided

for an antenna that transmits and receives a large number of beams, such as contiguous narrow beams that cover the United States. The network, which is connected to a layer of feed elements that transmit and receive microwaves, consists of a pair of circuit boards parallel to the feed element layer. One of the two boards has dividers that each divide a signal to be transmitted into seven portions, and the other board has 134 combiners that each collect seven transmit signal portions and deliver the sum to one of the feed elements. A similar arrangement is used to handle received signals, with 134 receive signal dividers on the one board, and 87 receive signal combiners on the other board. NASA

N83-19970*# National Aeronautics and Space Administration. Pasadena Office, Calif.
ELECTRONIC CONSCANNING SPACECRAFT COMMUNICATION SYSTEM Patent Application
James R. Lesh, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 14 Jan. 1983 13 p
(Contract NAS7-100)
(NASA-Case-NPO-15899-1; US-Patent-Appl-SN-457991) Avail: NTIS HC A02/MF A01 CSCL 17B

An electronic conscanning spacecraft communication system includes an array of antennas which produce a first synthesized conscanning narrow beam which by means of a conscan tracking phased array unit is steerable to circle around a spacecraft. Also included is a spacecraft tracking phased array unit, which produces a spacecraft tracking beam. The scanning beam is adjusted so that the spacecraft is at the circle center and further provides signals to adjust the beam to point directly at the spacecraft. NASA

N83-19971# Harry Diamond Labs., Adelphi, Md.
AIR TARGET MODELS FOR FUZING SIMULATIONS
John F. Dammann, Jr. Sep. 1982 50 p refs
(AD-A121473; HDL-TR-1960) Avail: NTIS HC A03/MF A01 CSCL 17/9

Radar backscatter models for air targets suitable for computer simulation of radar fuze-air target encounters are described. These models determine the characteristics of the energy reflected to the fuze when the target is illuminated by a fuze radar. When the target models are coupled with fuze models, the time when the fuze detects the presence of the target can be determined for any arbitrary terminal encounter geometry. Fuze detection times for representative trajectories can be compared with fuze specifications to measure fuze performance or can be used as a part of a simulation of an entire system to determine system performance. Following one basic methodology, target models have been written for the Fishbed, Foxbat, and Flogger fighter aircraft; the Hind-D helicopter; and the Backfire, Blinder, and B-1 bombers. All of the models are specular point models where the major return is assumed to come from a small number of glitter points or specular points on the target. GRA

N83-19972# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THEORY OF OPTIMUM RADIO RECEPTION METHODS IN RANDOM NOISE
L. S. Gutkin 24 Sep. 1982 449 p refs Transl. into ENGLISH of Mono. "Teoriya Optimalnykh Metodov Radiopriyema pri Fluktuatsionnykh Pomekhakh" Moscow, 1972 448 p
(AD-A120899; FTD-ID(RS)T-0784-82) Avail: NTIS HC A19/MF A01 CSCL 09/4

The theory of optimum methods of reception of signals on the background of random noise, widely used in development of any radioelectronic systems and devices based on reception and transmission of information (radar and radio controlled, radio communications, radio telemetry, radio astronomy, television, and other systems), as well as electroacoustical and wire communications sytems, is presented. Optimum linear and nonlinear filtration, binary and comples signal detection and discrimination, estimation of signal parameters, receiver synthesis for incomplete a priori data, special features of synthesis with respect to certain quality indicators, and other problems are examined. GRA

N83-19973# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NEW INTERNATIONAL AUTOMATIC TELEGRAPHIC COMMUNICATIONS OF POLAND
22 Oct. 1982 4 p Transl. into ENGLISH from Przeglad Telekomunikacyjny (Poland), v. 51, no. 11, 1978 p 351
(AD-A122019; FTD-ID(RS)T-1491-82) Avail: NTIS HC A02/MF A01 CSCL 17/2

Direct telegraphic communications have started between Poland and Canada via the CANTAT-2 undersea transatlantic cable. This cable connects Great Britain (Widemouth) and Canada (Beaver Harbour). Twenty-two telegraph lines were established between Canada and Poland for telex and telegram communication. GRA

N83-19974# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
COAXIAL CABLES FOR 10,800-CALL TELEPHONY
Tadeusz Lapinski 2 Nov. 1982 7 p Transl. into ENGLISH from Wiad. Elektrotech. (Poland), v. 15, no. 18, 1979 p 501-502
(AD-A122016; FTD-ID(RS)T-1321-82) Avail: NTIS HC A02/MF A01 CSCL 17/2

Long distance telecommunication cables with coaxial pairs of normal dimensions of the type 2.6/9.5 mm are used in 2700 call telephony in the frequency band up to 12.5 MHz. The increase of telephone traffic and its automization call for the creation of a large number of connections. A solution to this problem is possible through multiple call cable routes. Adaptation of normal size coaxial cables to 10,800 call telephony utilizing the frequency band up to 60 MHz is investigated. On each two coaxial pairs it is possible to make 10,800 simultaneous telephone connections. It means also the four fold reduction of the consumption of copper used for telephone connections. Cables with four and six coaxial pairs are made. The first of them can form 21,600 connections, and the second, 32,400 connections. An example of the construction of cables with six coaxial pairs is shown. GRA

N83-19975# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
LONG RANGE TELECOMMUNICATION CABLES WITH SMALL COAXIAL PAIRS
Tadeusz Lapinski 28 Sep. 1982 12 p Transl. into ENGLISH from Wiad. Telekomun. (Poland), v. 18, no. 4, Apr. 1978 p 119-121
(AD-A120926; FTD-ID(RS)T-1039-82) Avail: NTIS HC A02/MF A01 CSCL 09/1

The production of long range telecommunication cables with small coaxial pairs of the type 1,2/4,4 mm with aluminum cover and polyethylene coating was discussed. Coaxial cables were also reinforced with steel tape or round steel wires, and external polyethylene shielding to improve durability. The technical parameters which are allowable for the cables and which do not deteriorate their use performance were given. B.G.

N83-19976*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PARAMETER ESTIMATION FOR STATIC MODELS OF THE MAYPOLE HOOP/COLUMN ANTENNA SURFACE
H. T. Banks (Brown Univ.), P. L. Daniel (Southern Methodist Univ.), and E. S. Armstrong Aug. 1982 6 p refs Presented at the IEEE Intern. Large Scale Systems Symp., Virginia Beach, Va., 11-13 Oct. 1982
(Contracts NAS1-15810; NAS1-16394; Grants NAG1-258; AF-AFOSR-0198-81; NSF MCS-82-05355; NSF MCS-82-00883; AF Proj. 2304)
(NASA-TM-85172; NAS 1.15:85172; AD-A121464; AFOSR-82-0929TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The authors discuss theoretical and numerical results for spline based approximation schemes employed in parameter estimation algorithms for static distributed systems. A specific application involves estimation of parameters in models for the antenna surface in the deployable Maypole Hoop/Column antenna. Author (GRA)

N83-19977# University of Southern California, Los Angeles. Dept. of Electrical Engineering.
VLSI ARRAY PROCESSOR FOR SIGNAL PROCESSING Final Report, 1 Apr. 1980 - 31 Mar. 1982
Sun-Yuan Kung 16 Nov. 1982 26 p refs
(Contract N00014-80-C-0457)
(AD-A122078; Rept-1) Avail: NTIS HC A03/MF A01 CSCL 17/2

The research activities have focussed on the VLSI array processor for signal processing theory and algorithms and the development of parallel computing architectures. A solution in today's VLSI research challenge lies in a cross disciplinary research encompassing the areas of mathematics, algorithms, computers, and applications. To this end, this report summarizes two parallel major research tasks: (1) signal processing algorithm and theory and (2) parallel computing structures. GRA

N83-19978# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SEMI-AUTOMATIC CONTACTING SYSTEM GR-1 IN MARINE RADIOS
Andrzej Gorski 26 Oct. 1982 17 p Transl. into ENGLISH from Wiad. Telekomunikacyjne (Poland), no. 7/8, Jul.-Aug. 1980 p 233-236
(AD-A122012; FTD-ID(RS)T-1043-82) Avail: NTIS HC A02/MF A01 CSCL 17/2

A radio communication system was worked out that answers data transmission from ship to land and vice versa. The marine data transmission system is based on the system of narrow band radiotelegraphy with direct printout. The provisionally initiated system of remote printing telegraphy with detection and correction of errors, is based on existing conventional marine radio communication links. The basic block diagram of the system is presented. The operating procedures of the system are defined. The system of narrow band radio telegraphy with direct printout is automatic with regard to entry into and exit from the system. The assurance of the conditions for the correct automation of the system requires a proper quality of the signals received from both directions. GRA

N83-19979# Naval Research Lab., Washington, D. C.
CONVOLUTIONAL CODING OPTIONS FOR MFSK/FH SIGNALING ON RAYLEIGH FADING AND PARTIAL BAND INTERFERENCE CHANNELS
P. J. Crepeau and D. L. Tate 22 Nov. 1982 32 p refs
(Proj. X0695CC)
(AD-A122056; NRL-MR-4971) Avail: NTIS HC A03/MF A01 CSCL 09/4

Convolutional coding offers substantial improvement in the bit error probability performance of MFSK/FH modulation when applied to Rayleigh fading or partial band Gaussian interference channels. Using a 4-ary modulation with rate-1/2 codes as a special example, several convolutional coding options are considered, including binary, dual-2, and triple-2 codes. Union-Chernoff upper bounds reveal that improvements of up to 35 dB in (in Eb/N sub o reduction) are achievable at a .00001 bit error probability in comparison to an uncoded system. Author (GRA)

N83-19980# Ohio State Univ., Columbus. Electroscience Lab.
SOPHISTICATED JAMMERS AND ADAPTIVE ARRAYS Final Report
R. T. Compton, Jr. Oct. 1982 9 p refs
(Contract N00019-81-C-0093)
(AD-A121888; ESL-713603-9) Avail: NTIS HC A02/MF A01 CSCL 17/4

This report involves studies on the effectiveness of two types of jamming against adaptive arrays: envelope modulated jammers and cross-polarized jammers. GRA

N83-19981# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
THE INTEGRATION OF ROUTING AND FLOW-CONTROL FOR VOICE AND DATA IN A COMPUTER COMMUNICATION NETWORK Ph.D. Thesis
Eliezer Menaham Gafni Sep. 1982 165 p refs
(Contract N00014-75-C-1183; Grants NSF ECS-79-20834; NSF ECS-79-19880; ARPA Order 3045)
(AD-A120942; LIDS-TH-1239) Avail: NTIS HC A08/MF A01 CSCL 17/2

A store and forward computer communication network may concurrently support more than one type of user. Because of different user characteristics, the control of each type of user may be done by different mechanisms. Moreover, for each type of user there may be more than one control mechanism operating concurrently. Algorithms previously proposed for user-mechanism pairs were analysed independently ignoring the significant interactions among them. In this thesis, we consider the voice user and the data user, and the routing mechanism and the flow control mechanism. We propose four algorithms, one for each user-mechanism pair. We show that these algorithms are compatible in the sense that they can be coordinated to achieve some reasonable objective when operating concurrently. Moreover, some of the algorithms are superior in some aspects to existing ones. GRA

N83-19982# Boeing Aerospace Co., Seattle, Wash.
NONSPHERICAL PARTICLE INVESTIGATION Final Report, 25 Sep. 1981 - 25 Jun. 1982
C. D. Capps, A. R. Tokuda, and G. M. Hess Sep. 1982 36 p refs
(Contract N00164-81-C-0206)
(AD-A120906; NWSC/CR-RDTR-127) Avail: NTIS HC A03/MF A01 CSCL 20/8

Differential scattering patterns were photographically recorded from several types of nonspherical particles. Sizes were determined from the scattering patterns and compared with microscopically measured ones. Author (GRA)

N83-19983# Wisconsin Univ., Madison. Mathematics Research Center.
WAVE REFLECTION AND QUASIRESONANCE
R. E. Meyer Jul. 1982 34 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-80-01960)
(AD-A120961; MRC-TSR-2402) Avail: NTIS HC A03/MF A01 CSCL 12/1

Wave reflection by smooth media and resonance of systems with radiation damping are instructive examples of a failure of the standard approach to asymptotics. They are also good examples of a type of exponential asymptotics needed for the sciences. Successful modifications of conventional, singular-perturbation theory have been found for them and show some of the principles promising wider usefulness. They have led to recent developments in WKB-connection theory, which are also reported briefly. Author (GRA)

N83-19984# Wisconsin Univ., Madison. Mathematics Research Center.
TRAVELING WAVE SOLUTIONS OF A MULTISTABLE REACTION-DIFFUSION EQUATION
David Terman Sep. 1982 30 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-80-17158)
(AD-A120987; MRC-TSR-2417) Avail: NTIS HC A03/MF A01 CSCL 20/14

The equation considered here has been considered as a model for a variety of physical phenomena including population genetics and nerve conduction. Of primary interest is the eventual behavior of solutions of this equation. One expects the solution eventually to look like a traveling wave solution; that is, one which moves with constant shape and velocity. In this paper we determine all of the traveling wave solutions of the equation, showing there are situations when there exist an infinite number of traveling wave solutions. GRA

N83-19985# Hughes Aircraft Co., Fullerton, Calif.
MAINBEAM NOTCHER Final Technical Report, 19 Nov. 1980 - 30 Mar. 1982

Weldon Chapman, Stan Huber, and Tom Miller Griffiss AFB, N.Y. RADC Jul. 1982 82 p refs
(Contract F30602-81-C-0019; AF Proj. 4506)
(AD-A120981; HAC-FR-82-14-386; RADC-TR-82-199) Avail: NTIS HC A05/MF A01 CSCL 17/4

This report documents the development, evaluation, and design of mainbeam anti-jam techniques for successful operation of a C-band tracking radar in advanced ECM environments. The techniques addressed in this study employ an antenna array consisting of omnidirectional or high-gain subarray elements followed by a signal processor to remove mainbeam jamming and provide target detection and tracking. The signal processing techniques that were considered are similar well-known techniques used in the areas of adaptive array processing and high resolution spectrum estimation. Two procedures were developed and were shown to provide target detection in the presence of a high intensity mainbeam jammer. The extrapolation procedure employed extrapolation techniques to extend the apparent aperture of the antenna array and thereby achieve a narrow notch on the jammer while providing gain in the book direction of a nearby target. The maximum likelihood (ML) procedure provided both target detection and an estimate of its angle of arrival. The angle estimation feature offers a potential solution to the target tracking problem under mainbeam jamming conditions. GRA

N83-19986# Naval Research Lab., Washington, D. C. Target Characteristics Branch.
DOPPLER PROPERTIES OF POLYPHASE CODED PULSE COMPRESSION WAVEFORMS Interim Report
F. F. Kretschmer, Jr. and B. L. Lewis 30 Sep. 1982 26 p refs (SF12131691)
(AD-A121345; NRL-8635) Avail: NTIS HC A03/MF A01 CSCL 09/4

Doppler properties of the Frank polyphase code and the recently derived P1, P2, P3, and P4 polyphase codes are investigated and compared. An approximately 4 dB cyclic variation of the peak compressed signal is shown to occur as the Doppler frequency increases. The troughs in the peak-signal response occur whenever the total phase shift, due to Doppler, across the uncompressed pulse is an odd multiple of Pi radians. It is shown that although the P3 and P4 codes have larger zero-Doppler peak sidelobes than the other codes, the P3 and the P4 codes degrade less as the Doppler frequency increases. Also, the effects of amplitude weighting and receiver bandlimiting for both zero and nonzero Doppler are investigated. Author (GRA)

N83-19987# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
DEVELOPMENT OF A VOICE FUNNEL SYSTEM Quarterly Technical Report, 1 Feb. - 30 Apr. 1982
R. D. Rettberg Oct. 1982 34 p refs
(Contract MDA903-78-C-0356; ARPA Order 3653)
(AD-A121432; BBN-5009; QTR-15) Avail: NTIS HC A03/MF A01 CSCL 17/2

This Quarterly Technical Report covers work performed on the development of a high-speed interface, called a Voice Funnel, between digitized speech streams and a packet-switching communications network. GRA

N83-19988# Florida State Univ., Tallahassee. Dept. of Statistics.
ON THE STABILITY OF BAYES ESTIMATORS FOR GAUSSIAN PROCESSES
Ian W. McKeague Sep. 1982 21 p refs
(Contract DAAG2-82-K-0168)
(AD-A121471; ARO-19367.1MA) Avail: NTIS HC A02/MF A01 CSCL 17/2

We consider the Bayes estimator delta 0 for a Gaussian signal process observed in the presence of additive Gaussian noise under contamination of the signal or noise by QN-laws. Upper bounds on the increase in the mean square error of delta 0 over the minimum possible mean square error under contaminated noise or contaminated signal are given. It is shown that the performance of delta 0 is relatively close to optimal for small amounts of contamination. Author (GRA)

N83-19989# Utah State Univ., Logan. Center for Atmospheric and Space Sciences.
THE RESPONSE OF THE HIGH LATITUDE IONOSPHERE TO CONVECTION ELECTRIC FIELDS Final Report, 1 Feb. 1979 - 31 Jan. 1982
W. J. Raitt Hanscom AFB, Mass. AFGL 26 Aug. 1982 23 p refs
(Contract F19628-79-C-0025; AF Proj. 2311)
(AD-A121636; AFGL-TR-82-0246) Avail: NTIS HC A02/MF A01 CSCL 08/14

This report summarizes work done in developing and using a time-dependent computer model of the convecting high-latitude ionosphere to provide maps of the plasma density distribution as a function of latitude, local time, universal time and latitude for ranges of the geophysical parameters of season, geomagnetic activity and solar cycle. Author (GRA)

N83-19990# Texas Univ., Austin. Dept. of Civil Engineering.
EFFECT OF STATE OF STRESS ON VELOCITY OF LOW-AMPLITUDE SHEAR WAVES PROPAGATING ALONG PRINCIPAL STRESS DIRECTIONS IN DRY SAND Annual Report, 1 Oct. 1979 - 31 Dec. 1981
David P. Knox, Kenneth H. Stokoe, II, and Stewart E. Kopperman Mar. 1982 421 p refs
(Grant AF-AFOSR-0031-80; AF Proj. 2307)
(AD-A120426; AFOSR-82-0908TR) Avail: NTIS HC A18/MF A01 CSCL 20/11

The effect of state of stress on shear wave velocity was examined for shear waves propagated as body waves through a sand mass. Testing was performed in a triaxial testing device, which was designed to hold a cubic soil sample measuring 7 ft (2.1 m) on a side and which was used to apply an isotropic, biaxial or triaxial state of stress to the sample. The triaxial device is essentially a steel box, constructed of reinforced steel, which uses rubber membranes to apply a confining pressure along each of the principal axes. GRA

N83-19991# California Univ., Los Angeles. School of Engineering and Applied Science.
STRIPLINE-FED ARRAYS, MUTUAL COUPLING FROM FAR-FIELD DATA, MICROSTRIP Final Report
N. G. Alexopoulos and R. S. Elliott 27 Sep. 1982 14 p refs
(Contract DAAG29-79-C-0050)
(AD-A120482; UCLA-ENG-82-71) Avail: NTIS HC A02/MF A01 CSCL 09/5

Stripline fed slot arrays, mutual coupling from far field measurements and research on microstrip dipoles were studied. The results are summarized. GRA

N83-19992# Ohio State Univ., Columbus. Electroscience Lab.
THE DETERMINATION OF THE APERTURE DISTRIBUTION OF A LINEAR ARRAY THROUGH NEAR FIELD MEASUREMENTS
Roger F. Backhus Jun. 1982 174 p refs
(Contract N62269-80-C-0384)
(AD-A122150; ESL-713303-2) Avail: NTIS HC A08/MF A01 CSCL 20/14

An experimental approach for finding aperture distributions of linear array antennas is described and applied to a particular antenna. The approach utilizes a discrete source synthesis technique in which measurements of the radiated near field are substituted for the so called desired field, and element currents are calculated. Four sets of near field measurements were taken and are presented along with various current solutions. Checks on solution accuracy were accomplished through comparing computed near and Fresnel fields with measurements. It was found that fields computed from these currents correlated well with the radiated fields of the antenna. Solution reactivity was checked through inspection of the invisible regions of computed far field radiation plots of the currents isolated in free space. Both measurement sampling distance and measurement range were

varied in an effort to assess limitations of the technique.
Author (GRA)

N83-19993# Ohio State Univ., Columbus. Electroscience Lab.
THE PERFORMANCE OF A TRIPOLE ADAPTIVE ARRAY AGAINST CROSS-POLARIZED JAMMING
R. T. Compton, Jr. Oct. 1982 23 p refs
(Contract N00019-81-C-0093)
(AD-A122119; ESL-713603-8) Avail: NTIS HC A02/MF A01 CSCL 17/4

This report discusses the performance of an adaptive array using three mutually perpendicular dipoles (a tripole) against a cross-polarized jamming signal. The jamming consists of two statistically independent signals transmitted on orthogonally polarized antennas. It is shown that the adaptive array is least susceptible to such jamming if the desired signal is circularly polarized. It is most susceptible if the desired signal is linearly polarized. Author (GRA)

N83-19994# University of Southern California, Los Angeles. Communication Sciences Inst.
RESEARCH IN DIGITAL COMMUNICATIONS Final Report, 15 Mar. 1979 - 31 Aug. 1982
R. A. Scholtz and L. M. Silverman Nov. 1982 68 p refs
(Contract DAAG29-79-C-0054)
(AD-A122160; CSI-82-11-01; ARO-15943.69-EL) Avail: NTIS HC A04/MF A01 CSCL 17/2

Research included efforts in several areas of digital communications, namely spread-spectrum code design and sync acquisition, burst communications, network synchronization, radar pulse compression designs, communication over messy channels, and certain topics in system theory and signal processing. Significant progress has been made in most of these areas, with virtually none of the proposed problems having been found totally intractable. Throughout the duration of this contract, the reporting objective has been to place research results in the open literature where they will be available to all. Accordingly, this final report consists in large measure of a listing of papers produced under this contract, along with their abstracts. GRA

N83-19995# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
SCATTERING COEFFICIENT ESTIMATION: AN EXAMINATION OF THE NARROW-BEAM APPROXIMATION
Y. S. Kim, R. K. Moore, and R. G. Onstott Aug. 1982 38 p refs
(Contract N00014-76-C-1105; NR Proj. 307-383)
(AD-A122295; RSL-TR-331-23) Avail: NTIS HC A03/MF A01 CSCL 12/1

One quick and easy way of estimating scattering coefficient is to assume that the antenna beam is confined in a finite cone with constant gain inside and the range to the antenna is constant for all the cells inside the illuminated area. Also the variation of the incidence angle is assumed to be small enough inside the illuminated area so one can estimate the incidence angle with only the power return measurements. The above may not be true depending on the antenna gain shapes or the target characteristic. In this report, the so-called narrow-beam approximation is examined using a little more realistic antenna gain functions and range variation and also a specific incidence angle variation function. The numerical integration shows that the narrow beam approximation can give as much as 3.6 dB error for normal incidence to the target with rapidly varying incidence angle when the beamwidths are 9 deg wide. For the incidence angles of 10 deg or larger, the error is in the order of a dB or less depending on the beamwidths and target characteristics. GRA

N83-19996# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
LOCAL TELECOMMUNICATION CABLE WITH INSULATION LAYERS AND POLYETHYLENE JACKET
Tadeusz Lapinski 17 Nov. 1982 9 p Transl. into ENGLISH from Wiad. Telekomunikacyjne (Poland), v. 47, no. 3, 1 Feb. 1979 p 68-70
(AD-A122781; FTD-ID(RS)T-1240-82) Avail: NTIS HC A02/MF A01 CSCL 09/1

Local telecommunication cables with layers of insulation and a polyethylene jacket with an antimoisture shield were fabricated. The cable is produced with a number of quads: 5, 10, 15, 25, 35, and 50, with conducting wires of 0.8 mm diameter. The cable is designated with the symbol XTKMpX to distinguish it from multitube cable. Local cable of the XTKMpX type is laid in cable channels and directly in the ground over a terrain which is not likely to be hampered by mechanical damage and it can be laid or installed at ambient temperatures. GRA

N83-19997# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
LOCAL TELECOMMUNICATION CABLES LAYERED WITH INSULATION AND POLYETHYLENE COATINGS
Tadeusz Lapinski 15 Oct. 1982 5 p Transl. into ENGLISH from Wiad. Elektrotechniczne (Poland), v. 15, no. 18, 1979 p 501
(AD-A122722; FTD-ID(RS)T-1323-82) Avail: NTIS HC A02/MF A01 CSCL 17/2

Design and fabrication of telecommunication cables with rated effective capacitance of the quad matrix circuit equal to 50 nf/km were developed. B.G.

N83-19998# National Bureau of Standards, Boulder, Colo. Electromagnetic Fields Div.
DEVELOPMENT OF HIGH FREQUENCY ELECTROMAGNETIC MAPPING (HFEM) TECHNOLOGY Final Report
R. L. Jesch Apr. 1982 93 p refs
(Contract DE-AC20-80LC-10417)
(DE82-012773; DOE/LC-10417/T1) Avail: NTIS HC A05/MF A01

High frequency electromagnetic mapping (HFEM) techniques were developed for evaluating rubblized oil shale in the cold retort state in the modified in situ process. This technology development is also applicable for using HFEM techniques for diagnosing, monitoring, controlling and evaluating modified in situ retorts after they are ignited. The baseline data work required to design a high temperature sample holder and experiments for determining the EM properties of oil shale samples at elevated temperatures (200 to 500 C) are described. A theoretical approach is given for modeling oil shale retorts for electromagnetic sensing techniques by a spheroid with an average dielectric constant along with numerical results. Finally, the measurement results are given for the spent and raw shale samples that were obtained from portions of the ten half score samples plus the results of the electromagnetic transmission measurements taken on oil shale samples. DOE

N83-19999# Sandia Labs., Albuquerque, N. Mex.
RADAR ECHO FROM A FLAT CONDUCTING PLATE, NEAR AND FAR
C. S. Williams Jan. 1982 44 p
(Contract DE-AC04-76DP-00789)
(DE82-009343; SAND-81-2561) Avail: NTIS HC A03/MF A01

Over certain types of terrain, a radar fuze (or altimeter), by virtue of the horizontal component of its velocity, is likely to pass over various flat objects of limited size. The echo from such objects could have a duration less than that of one Doppler cycle, where the Doppler frequency is due to the vertical component of the velocity. If the terrain is principally made up of such objects, their echoes are in most cases entirely uncorrelated with each other. Hence, the total echo after mixing at the radar with the delayed transmitted wave would have a noise-like spectrum not at all confined to the Doppler-frequency band where the desired echo signal is expected. This would seriously degrade the performance of a radar that utilizes correlation. This work shows that the echo from a square flat plate will be of duration greater than the time it takes to pass over the plate if the height h > above it satisfies h a squared lambda where a is the plate-edge dimension and lambda is the radar wavelength. The results presented here can be used to determine the spatial region wherein the echo exists, and the magnitude and phase of the echo from such a plate. DOE

N83-20000# Helsinki Univ. of Technology, Otaniemi (Finland). Telecommunication Switching Lab.
QUALITY AND STANDARDIZATION OF TELECOMMUNICATION SWITCHING SYSTEM SOFTWARE
Kauko Ranko, Jorma Hivensaio, and Antti Myllykangas Dec. 1981 9 p refs Presented at the 4th Intern. Conf. on Software Eng. Telecommun. Switching Systems, Warwick, Engl., 20-24 Jul. 1981 (PB83-103440; ISBN-951-752-419-6; ISSN-0355-7057) Avail: NTIS HC A02/MF A01 CSCL 17B

The purpose of this paper has been to illustrate quality and standardization of switching system software from the authors point of view with the aim of developing standardization in the user environment. GRA

N83-20001# Helsinki Univ. of Technology, Otaniemi (Finland). Telecommunication Switching Lab.
FIBER OPTIC TECHNOLOGY AND ITS ROLE IN TELECOMMUNICATION NETWORKS
Kauko Rahko 1981 10 p refs Presented at the 26th Intern. Wissenschaftlichen Kolloq., Ilmenau, Finland, 26-30 Oct. 1981 (PB83-103507; ISBN-951-752-448-X; ISSN-0355-7057; Rept-8A/81) Avail: NTIS HC A02/MF A01 CSCL 17B

Optical transmission bitrates of the order of 100 Mbit/s with regenerator distances up to 50 km can be achieved. Even systems with a few Gbit/s bitrates were designed. In addition to the high capacity, fibers have several other properties that are desirable in signal transmission. The network structures and introduction of services in integrated networks are evaluated. GRA

N83-19768*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Radio Frequency and Microwave Subsystems Section.
VLBI COLLIMATION TOWER TECHNIQUE FOR TIME-DELAY STUDIES OF A LARGE GROUND STATION COMMUNICATIONS ANTENNA
T. Y. Otoshi, L. E. Young, and W. V. T. Rusch (Univ. of Southern California) *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 20-29 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 17B

N83-19769*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Section.
A NEAR-OPTIMUM RECEIVER STRUCTURE FOR THE DETECTION OF M-ARY OPTICAL PPM SIGNALS
S. J. Dolinar, Jr. *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 30-42 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 17B

N83-19775*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. TDA Mission Support Office.
ANTENNA ARRAYING PERFORMANCE FOR DEEP SPACE TELECOMMUNICATIONS SYSTEMS
C. T. Stelzried, A. L. Berman, and G. K. Noreen *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 83-88 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 17B

N83-19776*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Atmospheric Sciences Section.
S-BAND APERTURE EFFICIENCY OF THE DSS 13 26-METER ANTENNA WITH THE S-X COMMON APERTURE FEED
M. J. Klein *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 89-94 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 17B

N83-19785*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. TDA Engineering Section.
DSN GROUND COMMUNICATIONS FACILITY
R. H. Evans *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 200-209 (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 17B

N83-19786*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Tracking Systems and Applications Section.
MV-3 COMMUNICATION SUBSYSTEM
G. S. Parks, R. S. Markham, T. J. Rowden, and M. L. MacMedan *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 210-219 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 17B

N83-20213# Centre National d'Etudes des Telecommunications, Lannion (France).
OPERATIONAL FOLLOW-UP OF TELECOMMUNICATION EQUIPMENT BY SAMPLING, USING THE SADE SYSTEM [SUIVI EN EXPLOITATION PAR ECHANTILLONAGE DES MATERIELS DE TELECOMMUNICATIONS A L'AIDE DU SYSTEME SADE]
H. Cadin, G. Gouret, C. Heno, C. Pichonnet, and Y. Robert *In* ESA Reliability and Maintainability Sep. 1982 p 255-259 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20259# Centre National d'Etudes des Telecommunications, Lannion (France).
CHOICE AND APPROVAL OF COMPONENTS USED IN TELECOMMUNICATION EQUIPMENT [CHOIX ET AGREMENT DES COMPOSANTS ENTRANT DANS LA CONSTITUTION DES EQUIPEMENTS DE TELECOMMUNICATIONS]
J. V. Leridant (DAII Issy-les-Moulineaux, France) and J. Y. LeTraon *In* ESA Reliability and Maintainability Sep. 1982 p 579-583 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N83-20002# Committee on Science and Technology (U. S. House).
US ELECTRIC POWER SYSTEM RELIABILITY
Washington GPO 1982 386 p refs Hearings before the Subcomm. on Energy Develop. and Appl. and the Subcomm. on Energy Res. and Prod. of the Comm. on Sci. and Technol., 97th Congr., 2d Sess., 8, 10 Jun. 1982
(GPO-99-628) Avail: Subcommittee on Energy Development and Applications

Electric energy supply, transmission and distribution systems are investigated in order to determine priorities for legislation. The status and the outlook for electric power reliability are discussed. S.L.

N83-20003*# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
GUARANTEED ROBUSTNESS PROPERTIES OF MULTIVARIABLE, NONLINEAR, STOCHASTIC OPTIMAL REGULATORS
John N. Tsitsiklis and Michael Athans Feb. 1983 18 p refs Presented at the 22nd IEEE Conf. on Decision and Control
(Contract NGL-22-009-124)
(NASA-CR-170068; NAS 1.26:170068; LIDS-P-1283) Avail: NTIS HC A02/MF A01 CSCL 09C

The robustness of optimal regulators for nonlinear, deterministic and stochastic, multi-input dynamical systems is studied under the assumption that all state variables can be measured. It is shown that, under mild assumptions, such nonlinear regulators have a guaranteed infinite gain margin; moreover, they have a guaranteed 50 percent gain reduction margin and a 60 degree phase margin, in each feedback channel, provided that the system is linear in

the control and the penalty to the control is quadratic, thus extending the well-known properties of LQ regulators to nonlinear optimal designs. These results are also valid for infinite horizon, average cost, stochastic optimal control problems. B.W.

N83-20004*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

OFF-NADIR ANTENNA BIAS CORRECTION USING AMAZON RAIN SIGMA(0) DATA

I. J. Birrer, G. J. Dome (Bell Labs., Holmdel, N. J.), J. Sweet (Kentron Technical Center, Hampton Va.), G. Berthold, and R. K. Moore May 1982 83 p refs

(Grant NsF-1397)

(NASA-CR-165921; NAS 1.26:165921; RSL-TR-343-6) Avail: NTIS HC A05/MF A01 CSCL 09E

The radar response from the Amazon rain forest was studied to determine the suitability of this region for use as a standard target to calibrate a scatterometer like that proposed for the National Oceanic Satellite System (NOSS). Backscattering observations made by the SEASAT Scatterometer System (SASS) showed the Amazon rain forest to be a homogeneous, azimuthally-isotropic, radar target which was insensitive to polarization. The variation with angle of incidence was adequately modeled as scattering coefficient (dB) = a theta b with typical values for the incidence-angle coefficient from 0.07 to 0.15 dB/deg. A small diurnal effect occurs, with measurements at sunrise being 0.5 dB to 1 dB higher than the rest of the day. Maximum-likelihood estimation algorithms presented here permit determination of relative bias and true pointing angle for each beam. Specific implementation of these algorithms for the proposed NOSS scatterometer system is also discussed. Author

N83-20005# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.

MATERIAL OPTIMIZATION FOR HIGH ELECTRIC CURRENT, HIGH SPEED APPLICATIONS Final Report, 1 Jan. 1980 - 31 Dec. 1981

Ernest Rabinowicz, Alan Rozenfeld, and Jeanne M. Tanner 30 Sep. 1982 200 p refs

(Contract N00014-80-C-0316)

(AD-A121456) Avail: NTIS HC A09/MF A01 CSCL 20/3

Studies of electrical contacts carrying high currents have been carried out at speeds in the range 1.5 to 13 m/sec, and current densities in the range 1 to 3 amp/sq mm. As regards the wear of graphite brushes, it was shown that the wear rates were low when the ring metals were metallurgically incompatible with graphite. When silver-graphite brushes were used, low wear was associated with ring materials that were compatible both with silver and with carbon. An expression was developed for the temperature rise at the interface between sliding electrical contacts. This equation was tested indirectly using wear measurements and directly using a thermocouple technique. The agreement between theory and practice was reasonable, but more work is needed to define one key variable, namely the number of junctions formed at any one time. GRA

N83-20006# Raytheon Co., Huntsville, Ala. Life Cycle Analysis Group.

STORAGE RELIABILITY ANALYSIS SUMMARY REPORT. VOLUME 1: ELECTRICAL AND ELECTRONIC DEVICES Final Report, Sep. 1980 - Sep. 1982

Irvin L. Krulac and Harold B. Smith, Jr. Sep. 1982 260 p refs (Contract DAAH01-80-D-0020; DA Proj. 1W3-63313-D-087)

(AD-A122053; LC-82-2-Vol-1) Avail: NTIS HC A12/MF A01 CSCL 09/3

This document summarizes storage reliability data collected by US Army Missile Command on electrical and electronic devices over a period of several years. Sources of data are detailed, major failure modes and mechanisms are listed and discussed. Nonoperational failure rate prediction methodology is given, and conclusions and recommendations for enhancing the storage reliability of devices are drawn from the analysis of the data collected. Author (GRA)

N83-20007# Naval Air Engineering Center, Lakehurst, N.J.

THE 60-Hz TO 400-Hz ELECTRICAL POWER CONVERSION Final Report

Francis V. Kern 8 Nov. 1982 23 p refs

(WF41461000)

(AD-A122040; NAEC-92-170) Avail: NTIS HC A02/MF A01 CSCL 10/2

Report comments on present 400 Hz power distribution methods, presents a study to determine optimum 400 Hz power sources, and recommends a possible future source. Author (GRA)

N83-20008# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

A COMPUTER PROGRAM FOR THE DETERMINATION OF THE FLAT PLANE PROJECTION OF A PRINTED CIRCUIT TYPE STRAIN GAGE LEAD Interim Report, 1 Jan. 1980 - 1 Jan. 1981

Steven L. Puterbaugh and C. Herbert Law Sep. 1982 28 p

(AF Proj. 2307)

(AD-A122027; AFWAL-TR-82-2080) Avail: NTIS HC A03/MF A01 CSCL 07/2

A computer program is discussed which calculates and plots the flat plane projection of a printed circuit type strain gage lead which is to be attached to an axial compressor rotor or stator blade. The input required includes lead path descriptive coordinates and blade descriptive coordinates. Author (GRA)

N83-20009# Naval Ocean Research and Development Activity, Bay St. Louis, Miss. Ocean Science and Technology Lab.

ELECTRICAL CHARACTERISTICS OF SEA-WATER-RETURN TRANSMISSION LINES Final Report

N. Gholson, R. Swenson, and C. Alexander Aug. 1982 42 p refs

(AD-A121866; NORDA-52) Avail: NTIS HC A03/MF A01 CSCL 09/1

An experiment was conducted at sea to determine characteristics of three single copper conductor transmission lines. All three transmission lines incorporated seawater as an electrical return path and graphite shielding of various constructions in an attempt to achieve desirable characteristics of coaxial transmission lines. The transmission lines were 20,000 feet long, 0.1 inches in diameter, and used braided Kevlar at a strength member. The primary problem addresses was measuring low frequency (<20kHz) attenuation and phase shift of the transmission lines as a function of configuration in the water column and as a function of graphite shield construction. Results show that transmission line electrical characteristics as much better when the line is fully payed out as opposed to part of the line being coiled. GRA

N83-20010# Illinois Univ., Urbana. Electromagnetics Lab.

DIELECTRIC WAVEGUIDE GRATING FILTER Interim Technical Report

K. Webb and R. Mittra Nov. 1982 21 p refs

(Contracts DAAG29-82-K-0084; N00014-79-C-0424)

(AD-A121857; UIEM-82-11; UILU-ENG-82-2551; ARO-18054.4-EL) Avail: NTIS HC A02/MF A01 CSCL 09/5

A dielectric waveguide grating structure may be used as a band-reject filter. A transmission line model is used to predict the filter response. The experimental results agree well with theoretical predictions. Author (GRA)

N83-20011# Wisconsin Univ., Madison. Dept. of Electrical and Computer Engineering.

WIDEBAND MONOLITHIC MICROWAVE AMPLIFIER STUDY Annual Report, Jul. 1981 - Jul. 1982

J. B. Beyer, S. N. Prasad, J. E. Nordman, R. C. Becker, and G. K. Hoherwarter Oct. 1982 81 p refs

(Contract N00014-80-C-0923)

(AD-A120904; ECE-82-10) Avail: NTIS HC A05/MF A01 CSCL 09/5

The detailed study of factors limiting the performance of microwave monolithic distributed amplifiers utilizing GaAs(Gallium Arsenide) FETS(Field Effect Transistors) is continued. New

expressions for gain, attenuation constant, phase constant and optimum numbers of devices are given. A sensitivity analysis is carried out and a computer program to analyze amplifier performance and aid in design is presented. The report concludes with a practical design for an 8-device amplifier from 2 to 20 GHz having a gain of 4.75 dB at 20 GHz. Author (GRA)

N83-20012# Massachusetts Univ., Amherst. Dept. of Electrical and Computer Engineering.

NUMERICAL SIMULATION OF THE PERMEABLE BASE TRANSISTOR Final Report, 1 Apr. - 30 Jun. 1982

D. H. Navon and T. W. Tang Aug. 1982 59 p refs

(Contract N00014-82-M-0053)

(AD-A120883) Avail: NTIS HC A04/MF A01 CSCL 09/1

Predictions of improved high frequency performance of the gallium arsenide permeable base transistor (PBT) have been made by the exact diffusion-drift, two-dimensional numerical analysis of several PBT designs. In this study, both the device geometry and/or the impurity doping profile were varied and the corresponding unity-current-gain frequency, (f sub T), calculated. More than a 35% improvement in (f sub T) was predicted when the ration of the metal (Schottky) gate width to the space between gate fingers was varied. More than a doubling of (f sub T) could be obtained when the source and drain doping was increased to produce and n(+) n n(+) configuration. Each device design was analyzed to determine the change in mobile charge density with gate bias in the major areas of the structure in order to compute its contribution to the device input capacitance. In this way information was obtained on design details for reduced capacitance and transconductance change for improved (f sub T). A new UPBT structure was investigated where the semiconductor material above the gate electrode was removed in order to reduce this region's contribution to the capacitance. A 100% improvement in high frequency performance was predicted for this structure, operating at low gate voltages. Less gain was obtained at higher voltages. Control of the surface states on the exposed walls of this device must be provided to obtain this advantage. Author (GRA)

N83-20013# Lincoln Lab., Mass. Inst. of Tech., Lexington. Data Systems Div.

ADVANCED ELECTRONIC TECHNOLOGY Quarterly Technical Summary Report, 1 Feb. - 30 Apr. 1982

Alan J. McLaughlin and Alan L. McWhorter 15 May 1982 25 p ref

(Contract F19628-80-C-0002; AF Proj. 649L)

(AD-A120971; ESD-TR-82-054) Avail: NTIS HC A02/MF A01 CSCL 09/5

Data systems and solid state in the advanced electronic technology program are reported. Topics discussed include: digital integrated circuits, RVLSI circuits, restructurable VLSI technology, semiconductor processing device theory; computer systems; solid state device research, quantum electronics, materials research, microelectronics, analog device technology. GRA

N83-20014# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.

TRANSIENT PASSIVATION KINETICS OF REACTIVE METAL ELECTRODES. PART 1. THEORY

A. H. Zimmerman 27 Sep. 1982 27 p ref

(Contract F04701-81-C-0082)

(AD-A121819; TR-0082(2945-01)-6; SD-TR-82-78) Avail: NTIS HC A03/MF A01 CSCL 09/1

A chemical model is presented that describes the voltage delay often observed when an anodizing current is applied to a highly reactive metal electrode. The model considers the metal surface to be initially covered by a protective film that is disrupted by the passage of anodic current. Relaxation of the surface coverage causes a rise in electrode potential during the initial stages of anodization. The faradaic impedance represented by this model is calculated, and the dependence of the impedance on the rate constants and coverage parameters is examined. For this model, it is shown that voltage delay should exist only when the rate of surface-coverage relaxation is less than the rate of the principal charge transfer process. Author (GRA)

N83-20015# IBM Watson Research Center, Yorktown Heights, N.Y.

STUDY OF THE PHYSICS OF INSULATING FILMS AS RELATED TO THE RELIABILITY OF METAL-OXIDE-SEMICONDUCTOR (MOS) DEVICES Semiannual Technical Report, 1 Dec. 1981 - 31 May 1982

S. R. Brorson, I. F. Chang, J. F. DeGelormo, D. J. DiMaria, D. W. Dong, D. B. Dove, C. Falcony, A. Hurtstein, E. A. Irene, S. K. Lai et al Sep. 1982 76 p refs

(Contract MDA903-81-C-0100; ARPA Order 4012)

(AD-A121764) Avail: NTIS HC A05/MF A01 CSCL 20/12

This report contains a discussion of the effect of the gate metal on the build up of interface states at the Si-SiO2 interface. A method for reducing electron trapping in SiO2 that significantly increases the cyclability of electrically-alterable read-only storage devices is described. A new low voltage electroluminescent device was built that uses Si rich SiO2 charge injectors. Photon assisted tunneling and internal photoemission were measured on metal-oxide semiconductor samples. A quantum mechanical image force theory is used to explain the results. Studies of the temperature dependence of the oxidation rate of silicon indicate that there are two oxidant species responsible. Author (GRA)

N83-20016# California Univ., Berkeley. Electronics Research Lab.

JOINT SERVICES ELECTRONICS PROGRAM PROGRESS Annual Progress Report, 1 Sep. 1981 - 31 Aug. 1982

D. J. Angelakos 30 Sep. 1982 148 p refs

(Contract F49620-79-C-0178)

(AD-A121365; UCB/ERL-82/1) Avail: NTIS HC A07/MF A01 CSCL 09/5

An annual report of the JSEP (Joint Services Electronics Program) in Electromagnetics, Solid State Electronics, Materials and Devices, Quantum Electronics, and Information Sciences is presented. In addition, results of the research to date are summarized and significant accomplishments are indicated. GRA

N83-20017# Polytechnic Inst. of New York, Farmingdale. Microwave Research Inst.

BASIC RESEARCH IN ELECTRONICS (JSEP) Final Report, 1 Apr. 1980 - 31 Mar. 1981

Arthur A. Oliner 30 Sep. 1982 138 p refs

(Contract F49620-80-C-0077; AF Proj. 2305)

(AD-A121751; POLY-MRI-1435-82; AFOSR-82-0988TR) Avail: NTIS HC A07/MF A01 CSCL 09/5

This Final Report presents a summary of the scientific progress and accomplishments on research projects funded by the Joint Services Electronics Program (JSEP) for the contract period from 1 April 1980 through 31 March 1982. It does not contain information regarding accomplishments on research projects funded in other ways. The Joint Services Electronics Program at the Polytechnic is the core of interdisciplinary research in electronics encompassing programs in the Departments of Electrical Engineering, Physics and Chemistry under the aegis of the Microwave Research Institute. The research encompassed by this program is grouped under three broad categories: Electromagnetics, Solid State and Information Electronics. The detailed projects (work units) comprising the complete program are listed in the Table of Contents. In addition to the progress, we include for each of the work units the publications during the past year resulting from the research, and some of the recent interactions with the DOD or industry or other academic institutions. At the back of this Final Report we present our Report on Significant Scientific Accomplishments, and after that we append a comprehensive list of all the journal publications and conference proceedings during the period from August 1, 1980 to the present, arranged alphabetically according to the name of the first author. Author (GRA)

N83-20018# Rome Air Development Center, Griffiss AFB, N.Y.

CRT IMAGE DISTORTION DETERMINATION EXPERIMENT

In-House Report, May 1980 - Feb. 1982
James A. Sieffert Sep. 1982 58 p
(AF Proj. 4594)
(AD-A121399; RADC-TR-82-239) Avail: NTIS HC A04/MF A01 CSCL 09/1

An analytical photogrammetric approach was used to determine the geometric distortions of cursor coordinates on an image viewing and measuring system which included a television camera, the associated electronics and a cathode ray tube display. Computer programs were developed to provide the determination of common lens distortion parameters, the camera orientation and additional distortions due to the electronic components, all in several combinations. Measurements made with the use of a calibrated grid were processed through a least squares solution. The mathematical formulation of the various error types can be used to determine the respective errors completely, but not in a single simultaneous solution. Independent determinations of electronic distortion and camera position must be used and coordinate mensuration errors should be monitored and minimized.
Author (GRA)

N83-20019# Naval Research Lab., Washington, D. C.
A FAST PASSIVE INTEGRATOR
M. Raleigh and R. E. Pechacek 30 Sep. 1982 10 p
(RR0110941)
(AD-A121469; NRL-MR-4939) Avail: NTIS HC A02/MF A01 CSCL 14/2

This article describes a passive integrator designed to exploit the risetime capabilities of the 7A29 preamp in the Tektronix 7104 oscilloscope. The present application for this device is to integrate the signals from current and voltage probes on the NRL electron autoaccelerator. This device addresses three problems encountered with simple RC integrators. First, the parasitic capacitance across the resistor causes the output to overshoot when given a fast rising input. Second, the integrating capacitor will display a self resonance because of its inductance. Third, a preamp with a high input impedance is needed to avoid shortening the integrator decay time. This problem is solved by compensating the parasitic capacitances, keeping the resonances fast and damping them, and resistively coupling to the preamp. GRA

N83-20020# Boeing Aerospace Co., Seattle, Wash.
HIGH VOLTAGE TESTING. VOLUME 1: TEST PROGRAM REPORT Final Report, 29 Sep. 1979 - 1 Jul. 1982
W. G. Dunbar Wright-Patterson AFB, Ohio AFWAL 15 Jul. 1982 95 p 2 Vol.
(Contract F33615-79-C-2067; AF Proj. 3145)
(AD-A122102; AFWAL-TR-82-2057-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 10/2

The High Voltage Design Guide and High Voltage Specifications and Tests Documents referred to in this report pertain to high voltage/high power airborne equipment. A test plan was designed to evaluate and verify test parameters specified in these documents. This was done by writing detailed test procedures, obtaining representative test samples, and testing the specified parameters. In addition, a standard test fixture and corona-free 150 kV, 400 Hz power supply was specified, evaluated, and delivered for use with a partial discharge test set. Author (GRA)

N83-20021# Chelsea Coll., London (England). Dept. of Physics.
THEORY OF MANY-BODY EFFECTS IN SUB-MICROELECTRONIC SYSTEMS Final Technical Report, Nov. 1981 - Oct. 1982
L. A. Dissado and R. M. Hill Oct. 1982 60 p refs
(Contract DAJA37-81-C-0814)
(AD-A122331) Avail: NTIS HC A04/MF A01 CSCL 09/3

A new interpretation of the anomalous dispersion process which is observed at low frequencies is presented which is based on a realistic description of the structural ordering and fluctuation in carrier dominated dielectrics. It is shown that this form of response occurs for systems of low spatial dimensionality and generates a sample-size dependent conductivity. The relationship of the mechanism to that of power law noise in electrical systems is identified and the structural interpretation explored. Particular features of hydrogen bonded systems are described in which the dispersion is likely to be important in a biological context. It is pointed out that the process is directly relevant to solid-state batteries such as those based on fast-ion conductors such as Beta-alumina. GRA

N83-20022# Texas Univ., Austin. Electronics Research Center.
ELECTRONICS RESEARCH AT THE UNIVERSITY OF TEXAS AT AUSTIN Final Report, 1 Apr. 1977 - 31 Mar. 1982
Edward J. Powers 15 Sep. 1982 233 p refs
(Contract F49620-77-C-0101; AF Proj. 2305)
(AD-A122219; AFOSR-82-1035TR) Avail: NTIS HC A11/MF A01 CSCL 09/5

This report summarizes progress on projects carried out at the Electronics Research Center at the University of Texas at Austin and which were supported by the Joint Services Electronics Program. In the area of information electronics progress is reported for projects involving (1) nonlinear detection and estimation and (2) electronic multi-dimensional signal processing. In the solid state electronics area recent findings in (1) interface reactions, instabilities and transport and (2) spectroscopic studies of metal/semiconductor and metal/metal oxide interfaces are described. In the area of quanatum electronics progress is presented for the following projects: (1) nonlinear wave phenomena, (2) structure and kinetics of excited state molecules, and (3) collective effects in nonlinear optical interactions. In the electromagnetics area progress is guided-wave devices for the far infrared-mm wave spectrum is summarized. Author (GRA)

N83-20023# Lockheed Missiles and Space Co., Palo Alto, Calif.
SPARKING LIMITS, CAVITY LOADING, AND BEAM BREAKUP INSTABILITY ASSOCIATED WITH HIGH-CURRENT RF LINACS
R. J. Faehl, Don S. Lemons, and Lester E. Thode Jan. 1982 23 p refs
(Contract W-7405-eng-36)
(DE82-010842; LA-9126-MS) Avail: NTIS HC A02/MF A01

The limitations on high current RF linacs due to gap sparking, cavity loading, and the beam breakup instability are studied. It appears possible to achieve cavity accelerating gradients as high as 35 MV/m without sparking. Furthermore, a linear analysis, as well as self consistent particle simulations of a multipulsed 10 kA beam, indicated that only a negligible small fraction of energy is radiated into nonfundamental cavity modes. Finally, the beam breakup instability is analyzed and found to be able to magnify initial radial perturbations by a factor of no more than about 20 during the beam transit time through a 1 GeV accelerator.
DOE

N83-20024# Los Alamos Scientific Lab., N. Mex.
THE GYROCON RADIO FREQUENCY GENERATOR FOR FY-80 AND FY-81
Paul J. Tallerico Sep. 1982 18 p refs
(Contract W-7405-eng-36)
(DE83-002307; LA-9500-SR) Avail: NTIS HC A02/MF A01

Progress on the construction and testing of a 450-MHz prototype gyrocon is discussed. The gyrocon is a high power, high efficiency amplifier which operates by deflection modulation of an electron beam. The spatial bunching can be better than the temporal bunching in a klystron, especially for high output powers and uhf frequencies. Soviet gyrocons have produced over 40 MW of pulsed power at 430 MHz and 250-kW cw at 181 MHz. The maximum pulsed output power achieved in the reporting period is 1 kW. DOE

N83-20025# Westinghouse Electric Corp., Sharon, Pa. Medium Power Transformer Div.
BASIC RESEARCH ON TRANSFORMER LIFE CHARACTERISTICS Final Report
D. W. Allen, T. E. Alverson, E. J. Cham, R. D. Dresser, J. J. Kunes, G. F. Mitchell, C. L. Moore, H. A. Pearce, J. A. Robinson, H. R. Sheppard et al Sep. 1982 259 p Sponsored by EPRI

(EPRI Proj. 1289-2)
(DE83-900523; EPRI-EL-2622) Avail: NTIS HC A12/MF A01

Basic research of the significant parameters affecting transformer life are covered. Project objectives included test method definition and methods for scaling data obtained on conductor and subsubassembly models to predict the life characteristics of full-size transformers. Major parameters discussed include gas evolution during thermal aging of insulation and thermal, mechanical, and electrical stresses over time, both singly and in combination. The composition and the evolution rate of gases during the thermal aging of cellulose in oil were obtained as a function of time over a range of temperature from 1400 C to 1800 C. Gas initially evolved at 1800 C was basically similar to air with very little CO2. The dielectric strength of the turn insulation decreased in the presence of gas bubbles, but was relatively unaffected by the amount of gas or its composition. Data obtained from the thermal aging, short circuit, and dielectric tests of paper and film insulated conductor samples was used to provide design information for subassembly models. The subassembly models were subjected to life tests at 1800 C and 2000 C. An end of life criterion was arbitrarily set at a fifty percent reduction of the dielectric strength in the conductor insulation. DOE

N83-20026# General Electric Co., Schenectady, N. Y. Electric Utility Systems Engineering Dept.
CARRIER FREQUENCY NOISE FROM HVDC CONVERTERS Final Report
F. A. Fisher, L. D. Griess, J. J. LaForest, and C. B. Lindh Aug. 1982 315 p refs
(DE83-900260; EPRI-EL-2545) Avail: NTIS HC A14/MF A01

The development of an ac and dc side carrier frequency noise model for incorporation in the Bonneville Power Administration's ElectroMagnetic Transient Program (EMTP) is described. This model of an HVDC Station generates the characteristic wave shapes of voltages and currents in the time plane on which a Fast Fourier Transformer (FFT) is applied. The model representation of HVDC equipment such as converter transformers, smoothing reactors and harmonic filters is compared with de-energized impedance measurements of similar equipment in an HVDC Station. The carrier frequency range for the model covered is 10 kHz - 300 kHz. The measurements were obtained on the valve side and line side of the converter for both ac and dc sides. The calculated and measured noise were compared. The different measuring methods are described. A preferred measurement program is suggested and guidelines are indicated for power line carrier (plc) signal to noise ratios. DOE

N83-20027# National Bureau of Standards, Washington, D.C.
MEASUREMENT TECHNIQUES FOR HIGH POWER SEMICONDUCTOR MATERIALS AND DEVICES Annual Interim Report, 1 Oct. 1980 - 31 Dec. 1981
W. R. Thurber, W. E. Phillips, and R. D. Larrabee Aug. 1982 67 p refs
(Contract EA-77-A-01-6010)
(PB83-100321; NBSIR-82-2552) Avail: NTIS HC A04/MF A01 CSCL 09A

This annual report describes results of NBS research directed toward the development of measurement methods for semiconductor materials and devices which will lead to more effective use of high-power semiconductor devices in applications for energy generation, transmission, conversion, and conservation. Emphasis is on the development of measurement methods for power-device grade silicon. Major accomplishments during this reporting period were: (1) characterizing by deep level transient spectroscopy (DLTS) the energy levels in silicon power rectifier diodes, (2) writing of a computer program to predict lifetime-related parameters using as input the measured properties of the deep energy levels, (3) developing a novel method to detect nonexponential transients using a conventional double-boxcar DLTS system and (4) analyzing transient capacitance measurements to extent the techniques to nonexponential decays. Author (GRA)

N83-20195# Ste pour l'Etude et la Fabrication de Circuits Integres Speciaux, Grenoble (France).
PAD: A FAULT TOLERANCE SPECIFIC CIRCUIT [LE PAD: UN CIRCUIT SPECIFIQUE DE LA SPECIFIQUE DE LA TOLERANCE AUX FAULTES]
J. Chavade (CNRS, Toulouse) and Y. Crouzet *In* ESA Reliability and Maintainability Sep. 1982 p 117-125 refs In FRENCH (For primary document see N83-20178 10-38)
(Contract DRET-78/447)
Avail: NTIS HC A99/MF A01

N83-20221# Selenia S.p.A., Rome (Italy).
MAINTAINABILITY AND AVAILABILITY IN MODERN ELECTRONIC SYSTEMS: DESIGN FEATURES AND EVALUATION TECHNIQUES
B. Figliuzzi and G. A. Sparagna *In* ESA Reliability and Maintainability Sep. 1982 p 305-312 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20243# Centro Studi e Laboratori Telecomunicazioni, Turin (Italy).
EVALUATION OF THE RELIABILITY OF HIGH RADIANCE BURRUS DIODES [EVALUATION DE LA FIABILITE DES DIODES DE BURRUS A HAUTE RADIANCE]
A. Antolini, C. Gausco, and A. Piccirillo *In* ESA Reliability and Maintainability Sep. 1982 p 475-482 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20244# British Telecom International (England).
AN APPRAISAL OF INTEGRATED CIRCUIT RELIABILITY PREDICTION MODELS
C. Johnston and F. H. Reynolds (British Telecom Research Labs., Ipswich, England) *In* ESA Reliability and Maintainability Sep. 1982 p 483-488 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20248# Laboratoire Central des Industries Electriques (France).
ANALYSIS OF PERCENTAGE OF DEFECTS IN INTEGRATED DIGITAL CIRCUITS DURING ELECTRICAL TESTS
J. C. Gourdon and C. Leclerq *In* ESA Reliability and Maintainability Sep. 1982 p 505-510 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20249# MATRA Harris Semiconducteurs, Nantes (France).
IMPROVING THE RELIABILITY OF VLSI CIRCUITS BY CONSTRAINTS AND BY ELECTRIC TESTS [AMELIORATION DE LA FIABILITE DE CIRCUITS VLSI PAR CONTRAINTES ET TESTS ELECTRIQUES]
M. Potin and J. Robineau *In* ESA Reliability and Maintainability Sep. 1982 p 511-515 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20252# Radiotechniques S. A., Caen (France).
ANALYSIS OF FAILURE DURING THE MANUFACTURING OF INTEGRATED CIRCUITS [L'ANALYSE DE DEFAILLANCE EN COURS DE FABRICATION DE CIRCUITS INTEGRES]
C. Damm and N. Sirot *In* ESA Reliability and Maintainability Sep. 1982 p 533-536 In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20255# Modena Univ. (Italy). Inst. di Fisica.
INVESTIGATION OF FAST SCHOTTKY CONTACT RELIABILITY USING PLASMA ETCHING
G. Ottaviani, C. Guasco (Centro Studi e Lab. Telecommunicazioni), and D. Riva (Centro Studie e Lab. Telecommunicazioni) *In* ESA Reliability and Maintainability Sep. 1982 p 553-556 refs (For

primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20256# Nippon Electric Co. Ltd., Kanagawa (Japan).
RELIABILITY DESIGN ANALYSIS ON ELECTRIC DOUBLE LAYER CAPACITOR: SUPERCAP
N. Watanabe *In* ESA Reliability and Maintainability Sep. 1982 p 557-563 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20257# Silesian Technical Univ., Gliwice (Poland).
DETERMINING ELECTRONIC COMPONENTS RELIABILITY BY ACCELERATED LIFE TESTS
M. Budka and E. Czogala *In* ESA Reliability and Maintainability Sep. 1982 p 565-568 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20264# Institut de Mathematiques Appliquees de Grenoble (France).
DYNAMIC ANALYSIS TESTING OF VERY HIGHLY INTEGRATED CIRCUITS [LE TEST PAR ANALYSE DYNAMIQUE DES CIRCUITS A TRES HAUTE INTEGRATION]
G. Saucier and P. Basset *In* ESA Reliability and Maintainability Sep. 1982 p 611-618 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20271# Bordeaux Univ. (France).
CHARACTERIZATION AND TESTING OF SYNCHRONIZER CIRCUITS
P. Marchegay, P. Nouel, E. Garnier, and G. Lacroix *In* ESA Reliability and Maintainability Sep. 1982 663-667 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N83-20028*# Vought Corp., Dallas, Tex.
ORBITER RADIATOR PANEL SOLAR FOCUSING TEST
Harold R. Howell Dec. 1982 200 p refs
(Contract NAS9-14907)
(NASA-CR-167784; NAS 1.26:167784; V-2-53200/2R-53333) Avail: NTIS HC A09/MF A01 CSCL 20D

A test was conducted to determine the solar reflections from the Orbiter radiator panels. A one-tenth scale model of the forward and mid-forward radiator panels in the deployed position was utilized in the test. Test data was obtained to define the reflected one-sun envelope for the embossed silver/Teflon radiator coating. The effects of the double contour on the forward radiator panels were included in the test. Solar concentrations of 2 suns were measured and the one-sun envelope was found to extend approximately 86 inches above the radiator panel. A limited amount of test data was also obtained for the radiator panels with the smooth silver/Teflon coating to support the planned EVA on the Orbiter STS-5 flight. Reflected solar flux concentrations as high as 8 suns were observed with the smooth coating and the one-sun envelope was determined to extend 195 inches above the panel. It is recommended that additional testing be conducted to define the reflected solar environment beyond the one-sun boundary.
Author

N83-20029*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMOMECHANICAL LOADING OF MULTILAYERED CYLINDRICAL GEOMETRIES IN THERMAL CYCLING FROM 300 TO 1300 K
R. C. Hendricks, G. McDonald, R. L. Mullen (Case Western Reserve Univ.), M. J. Braun (Akron Univ.), B. T. Chung (Akron Univ.), and J. Padovan (Akron Univ.) 1983 28 p refs Presented at the Thermal Eng. Joint Conf., Honolulu, Hawaii, 20-24 Mar. 1983; sponsored by the ASME and the Japan Society of Mechanical Engineers
(NASA-TM-83312; E-1518; NAS 1.15:83312) Avail: NTIS HC A03/MF A01 CSCL 20D

The principal of multiple material layering is well known as an effective method of reducing heat transfer; however, thermal gradients can impose significant loads and lead to delamination and subsequent component failure. An analysis is developed and experimental data are discussed for the thermomechanical effects of multilayered materials on a heat sink substrate of cylindrical geometry subject to thermal cycling. The geometry is heated in cross-flow by a high-velocity flame and cooled in crossflow by ambient-temperature air from a critical flow orifice. Each layer of material possesses a threshold beyond which small changes in temperature or mechanical loading greatly influence the life in thermal cycling of the layered materials. Comparisons are made between the thermomechanical loads predicted by various numerical codes for the linear case and by a simplified analytic model.
Author

N83-20030# National Aerospace Lab., Kakuda (Japan).
EXPERIMENTAL INVESTIGATION ON THE VIBRATIONS OF FLUID-FILLED SPHERICAL SHELLS
1982 31 p refs In JAPANESE; ENGLISH summary
(NAL-TR-735; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

Experimental data on the vibration of spherical shells partially filled with liquid are presented, thus demonstrating the effect of the liquid on the vibration of spherical shell segments. Tests were performed on aluminum spherical shell segments under the following three boundary conditions: clamped, ring stiffened, and free edge. Holographic interferometry was applied to detect the resonant frequencies and to identify resonant modes of the shells. In conjunction with the experiment, a numerical analysis was carried out by means of the boundary element method combined with the finite element method.
Author

N83-20031*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STUDIES OF SIDEWALL BOUNDARY LAYER IN THE LANGLEY 0.3 METER TRANSONIC CRYOGENIC TUNNEL WITH AND WITHOUT SUCTION
A. V. Murthy, Charles B. Johnson, Edward J. Ray, Pierce L. Lawing, and Jerry J. Thibodeaux Mar. 1983 50 p refs
(NASA-TP-2096; L-15437; NAS 1.60:2096) Avail: NTIS HC A03/MF A01 CSCL 20D

Boundary layer measurements on the sidewalls of the Langley 0.3 Meter Transonic Cryogenic Tunnel were made to determine the effectiveness of the passive boundary layer bleed system over a Reynolds number range from 20 to 200 x 10 to the sixth power per meter at Mach numbers from 0.30 to 0.76. The tunnel sidewall boundary layer displacement thickness was about 2 percent of the width of the test section without the boundary layer bleed. Measured velocity profiles correlated well with the defect law of Hama. With the boundary layer bleed equivalent to about 2 percent of the test section mass flow, the boundary layer displacement thickness reduced to about 1 percent of the test section width, which is generally considered acceptable for testing airfoils. It was also noticed that effectiveness of the bleed was nearly independent of the Mach number and Reynolds number over the range of conditions tested. A comparison of the measured suction effectiveness of the bleed with the finite difference and integral methods of boundary layer calculation showed good agreement.
Author

N83-20032*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REDUCTION METHODS FOR NONLINEAR STEADY-STATE THERMAL ANALYSIS

Ahmed K. Noor, Chad D. Balch, and Macon A. Shibut (George Washington Univ., Hampton, Va.) Mar. 1983 48 p refs
(NASA-TP-2098; L-15501; NAS 1.60:2098) Avail: NTIS HC A03/MF A01 CSCL 20D

Hybrid analysis techniques and a problem adaptive computational algorithm are presented for predicting the nonlinear steady state temperature distribution in structures and solids. In the proposed techniques, the structure is discretized by using the finite element method. The vector of nodal temperatures is then expressed as a linear combination of a small number of global temperature modes (or basis vectors), and the Bubnov Galerkin technique is used to compute the amplitudes of the global modes. The global temperature modes (or basis vectors) are chosen to include the various order derivatives of the nodal temperature vector with respect to preselected path parameter(s). The potential of the proposed reductioon methods for solution of large scale, nonlinear thermal problems is discussed and the effectiveness of the methods is demonstrated by means of numerical examples, including steady state conduction, convection, and radiation modes of heat transfer. Author

N83-20033*# Northwestern Univ., Evanston, Ill. Dept. of Mechanical and Nuclear Engineering.
EFFICIENT LINEAR AND NONLINEAR HEAT CONDUCTION WITH A QUADRILATERAL ELEMENT
Wing Kam Liu and Ted Belytschko [1983] 38 p refs
(Contracts NAG1-210; F49620-82-K-0013)
(NASA-CR-170065; NAS 1.26:170065) Avail: NTIS HC A03/MF A01 CSCL 20D

A method is presented for performing efficient and stable finite element calculations of heat conduction with quadrilaterals using one-point quadrature. The stability in space is obtained by using a stabilization matrix which is orthogonal to all linear fields and its magnitude is determined by a stabilization parameter. It is shown that the accuracy is almost independent of the value of the stabilization parameter over a wide range of values; in fact, the values 3, 2, and 1 for the normalized stabilization parameter lead to the 5-point, 9-point finite difference, and fully integrated finite element operators, respectively, for rectangular meshes and have identical rates of convergence in the L2 norm. Eigenvalues of the element matrices, which are needed for stability limits, are also given. Numerical applications are used to show that the method yields accurate solutions with large increases in efficiency, particularly in nonlinear problems. M.G.

N83-20034# Naval Ship Research and Development Center, Bethesda, Md. Office of the Numerical Ship Hydrodynamics Program.
ON THE MATHEMATICAL THEORY OF THE MOTION OF FLOATING BODIES: AN UPDATE Final Report
Ralph E. Kleinman Oct. 1982 70 p refs
(RR0140302)
(AD-A121433; DTNSRDC-82/074) Avail: NTIS HC A04/MF A01 CSCL 12/1

The generation of surface waves in a fluid caused by a partially submerged body is modeled mathematically as a boundary value problem for the Laplacian with Neumann data on the bottom of the fluid container and on the body, a linearized free surface condition and a radiation condition at infinity. Fritz John (Comm. Pure Appl. Math., III, 1950) showed that the problem had a unique solution only under rather restrictive assumptions on the body geometry and reformulated the problem as an integral equation which was not uniquely solvable at certain irregular frequencies. In the present work, uniqueness is established for more general geometries, allowing corners and nonnormal intersections of the body with the free surfaces. Also presented are two methods of modifying the integral equation so that it is uniquely solvable for all frequencies. One method involves introducing an additional integral on the waterplane, while in the second method, an additional integral term is added to the equation which remains an equation only over the submerged portion of the body. GRA

N83-20035# Naval Ocean Systems Center, San Diego, Calif. Electronics Div.
SINGULAR PERTURBATIONS OF THE PAIDOUSSIS EQUATION: A THIN CYLINDER IN AN AXIAL FLOW Final Report, Feb. - Mar. 1982
M. J. Shensa 15 Jun. 1982 25 p refs
(AD-A121435; NOSC-TR-796) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report examines, from the viewpoint of singular perturbation theory, a fourth order partial differential equation which was derived by Paidoussis as a model for the behavior of a thin cylinder in an axial flow. It is found that for sufficiently large form drag (c sub t $<$ 1/2) and small flexural rigidity the influence of the higher order boundary conditions is restricted to the boundary; i.e., the reduced equation is a good approximation. Furthermore for small frequencies the downstream boundary conditions can be ignored in the sense that outside of the very end of the cylinder, their effect on the solution is negligible. Finally, an examination of the characteristics of the reduced PDE leads one to conjecture that this remains true in the case (c sub t $<$ 1/2). GRA

N83-20036# Naval Research Lab., Washington, D. C. Marine Technology Div.
VORTEX SHEDDING FROM CABLES AND STRUCTURES IN A SHEAR FLOW: STATE-OF-THE-ART Final Report, Oct. 1980 - Aug. 1982
Owen M. Griffin Nov. 1982 60 p refs
(Contract N68305-82-WR-20092; YF60534091)
(AD-A121864; NCEL-CR-83-004) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report examines the general problem of the flow about bluff bodies in a shear flow in light of the present state of knowledge for these flows, and relates existing studies to the vortex excited oscillations of slender, flexible structures in air and in water. Experiments with circular cylinders are emphasized, although reference also is made to experiments conducted with cylinders of other cross sections (D-section cylinders, rectangular cylinders, etc.). Some recent experiments with flexible cables in a shear flow are discussed to the extent possible. GRA

N83-20037# Wisconsin Univ., Madison. Mathematics Research Center.
UNSTABLE VISCO-ELASTIC FLUID FLOW EXHIBITING HYSTERITIC PHASE CHANGES
J. K. Hunter and M. Slemrod Aug. 1982 28 p refs
(Contract DAAG29-80-C-0041; Grants AF-AFOSR-0172-81; NSF MCS-79-27062)
(AD-A120970; MRC-TSR-2411) Avail: NTIS HC A03/MF A01 CSCL 20/4

This paper gives a mathematical theory for a visco-elastic fluid exhibiting a hysterisis loop in the shear stress vs. shear rate plane. The main rheological idea is to introduce a constitutive equation of rate type whose steady shear stress vs. shear rate locus is non-monotone. The main mathematical idea is to use a local shock structure theory to pick out the admissible solutions in loading and unloading of the applied driving force. GRA

N83-20038# Wisconsin Univ., Madison. Mathematics Research Center.
A NOTE ON SOLITARY AND CNOIDAL WAVES WITH SURFACE TENSION
Jean-Marc Vanden-Broeck and M. C. Shen Jul. 1982 13 p refs
(Contract DAAG29-80-C-0041; Grants NSF MCS-80-01960; NSF MCS-79-27062)
(AD-A120964; MRC-TSR-2405) Avail: NTIS HC A02/MF A01 CSCL 20/4

The influence of surface tension on solitary and cnoidal waves is discussed. This problem was first considered by Korteweg and de Vries. Shinbrot attempted to derive Korteweg and de Vries results by a formal perturbation expansion. However, a part of his results is incorrect. In this note, an approach different from those is used to construct a correct perturbation solution. GRA

N83-20039# Wisconsin Univ., Madison. Mathematics Research Center.
FINITE-AMPLITUDE STEADY WAVES IN STRATIFIED FLUIDS
J. L. Bona (Chicago Univ.), D. K. Bose (Brighton Polytechnic), and R. E. L. Turner Jul. 1982 84 p refs Sponsored in part by the U.K. Science Research Council
(Contract DAAG29-80-C-0041; Grants NSF MCS-80-02327; NSF MCS-79-04426)
(AD-A120960; MRC-TSR-2401) Avail: NTIS HC A05/MF A01 CSCL 12/1

An exact theory regarding solitary internal gravity waves in stratified fluids is presented. Two dimensional, inviscid, incompressible flows confined between plane horizontal rigid boundaries are considered. Variational techniques are used to demonstrate that the Euler equations possess solutions that represent progressing waves of permanent form. These are analogous to the surface, solitary waves so easily generated in a flume. Periodic wave trains of permanent form, the analogue of the classical cnoidal waves, are also found. Moreover, internal solitary-wave solutions are shown to arise as the limit of cnoidal wave trains as the period length grows unboundedly. GRA

N83-20040# Wisconsin Univ., Madison. Mathematics Research Center.
NONLINEAR CAPILLARY WAVES UNDER GRAVITY WITH EDGE CONSTRAINTS IN A CHANNEL Technical Summary Report
M. C. Shen Jun. 1982 19 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-80-01960)
(AD-A120955; MRC-TSR-2396) Avail: NTIS HC A02/MF A01 CSCL 20/4

An equation of the K-dV type is derived for the study of nonlinear surface waves under gravity with surface tension and edge constraints in a channel of variable cross section. The approach used here is based upon a nonlinear ray method. An example of a symmetric rectangular channel with variable width is given. Author (GRA)

N83-20041# Naval Postgraduate School, Monterey, Calif. Dept. of Acoustic Engineering.
TWO-PHASE LAMINAR BOUNDARY LAYER FLOW AROUND A WEDGE M.S. Thesis
Dirk vanDord Jun. 1982 63 p refs
(AD-A121983) Avail: NTIS HC A04/MF A01 CSCL 20/4

This thesis theoretically presents the phenomena involved in the flow of an incompressible fluid over a wedge with a second incompressible, lighter, and less viscous fluid blown through the surface of the wedge. A method is developed to determine the inner fluid layer thickness, the wall shear stress and the resulting local drag reduction. The results predict substantial drag reduction. Author (GRA)

N83-20042# Naval Postgraduate School, Monterey, Calif.
A CRITICAL REVIEW OF HEAT TRANSFER ENHANCEMENT TECHNIQUES FOR USE IN MARINE CONDENSERS Annual Report, 1 Oct. 1981 - 30 Sep. 1982
Paul J. Marto and Robert H. Nunn Sep. 1982 64 p refs
(AD-A121971; NPS69-82-006) Avail: NTIS HC A04/MF A01 CSCL 13/10

A variety of heat transfer enhancement techniques are reviewed and evaluated for use in marine condensers. This review includes tube-side enhancement, as well as shell-side enhancement techniques. At present, the most promising technique to enhance heat transfer on the tube side is with one of the commercially available, mildly intented, corrugated tubes. With this type of tube, the shell-side heat transfer enhancement is not as large and is uncertain due to the, as yet determined, complex effects of vapor shear and condensate inundation. Large bundle tests with enhanced tubing are therefore required before the details of tube-to-tube interaction will be fully understood. Author (GRA)

N83-20043# Wisconsin Univ., Madison. Mathematics Research Center.
THE VISCOSITY-CAPILLARITY ADMISSIBILITY CRITERION FOR SHOCKS AND PHASE TRANSITIONS Technical Summary Report
R. Hagan and M. Slemrod Aug. 1982 49 p refs
(Contract DAAG29-80-C-0041; Grant AF-AFOSR-0172-81)
(AD-A120988; MRC-TSR-2413) Avail: NTIS HC A03/MF A01 CSCL 20/4

This paper considers admissibility criteria for non-linear conservation laws based on (i) viscosity and (ii) capillarity and viscosity. It is shown by means of specific examples that while (ii) yields results consistent with experiment for materials exhibiting phase transitions, e.g., a van der Waals fluid, (i) does not. GRA

N83-20044# Wisconsin Univ., Madison. Mathematics Research Center.
A CUSP-LIKE FREE-SURFACE FLOW DUE TO A SUBMERGED SOURCE OR SINK
E. O. Tuck (Adelaide Univ.) and J.-M. Vanden-Broeck Sep. 1982 17 p refs
(Contract DAAG29-80-C-0041; Grants NSF MCS-79-27062; NSF MCS-80-01960)
(AD-A120985; MRC-TSR-2418) Avail: NTIS HC A02/MF A01 CSCL 20/4

We consider the steady flow induced by a line source placed at a given depth beneath the undisturbed level of a free-surface. We assume that the flow bifurcates at a definite point somewhere between the source and the undisturbed free-surface level. The free-surface at this point is cusp-like, the tip of the cusp pointing toward the source. The model is motivated by hydraulic problems of water entry or extraction from a reservoir. The problem is solved numerically by collocation. A unique solution is obtained whose cusp lies at 74.938% of the depth of the source. Author (GRA)

N83-20045# Essex Univ., Colchester (England). Mathematics Research Center.
EXPERIMENTS ON WAVE TRAPPING BY A SUBMERGED CYLINDRICAL ISLAND
B. J. S. Barnard, W. G. Pritchard, and D. G. Provis Madison, Wisc. Wisconsin Univ. Aug. 1982 35 p refs Prepared in cooperation with Wisconsin Univ., Madison
(Contract DAAG29-80-C-0041)
(AD-A120983; MRC-TSR-2412) Avail: NTIS HC A03/MF A01 CSCL 20/1

A description is given of some experiments made to examine the possible trapping of surface waves by a submerged cylindrical sill in an otherwise uniform ocean. Theories by Longuet-Higgins (1967) and Renardy (1981) indicate that, at certain dangerous frequencies, nearly resonant conditions may obtain, leading to unusually large wavefields over the sill. These resonances have been sought experimentally by examining two functionals of the wavefield over the sill to see if they should become unusually large near certain of the dangerous frequencies. The results show no manifestation whatsoever of the resonances. Possible reasons for the discrepancies are considered. It has, however, been observed that, at certain locations over the sill, the waves were amplified by a factor of four or five times their magnitude in the ocean, irrespective of the frequency in a certain interval. This could be an important consideration for the siting of rigs on prominent topographic features of the ocean bed. GRA

N83-20046# Illinois Inst. of Tech., Chicago. Dept. of Mechanical Engineering.
INSTABILITIES IN NEAR FIELD OF TURBULENT JETS AND THEIR DEPENDENCE ON INITIAL CONDITIONS AND REYNOLDS NUMBER Interim Report
Robert E. Drubka and Hassan M. Nagib Dec. 1981 429 p refs
(Contracts F49620-80-C-0053; F49620-78-C-0047; AF Proj. 2307)
(AD-A121367; R81-2; AFOSR-82-0962TR) Avail: NTIS HC A19/MF A01 CSCL 20/4

Near-field pressure and velocity measurements, along with multiple flow visualization techniques, were obtained at several azimuthal positions to establish the effect of initial conditions and Reynolds number on the development and nature of instabilities

in the initial region of axisymmetric free jets. In cases where the exit boundary layer is laminar, the natural jet is found to be unstable alternately to axisymmetric and helical modes having Strouhal numbers of 0.013 and 0.016, respectively. The scaling of these modes is independent of Reynolds number and initial jet disturbance level. However, the disturbance level does not determine the sensitivity of the initial region to the helical mode. When the initial axisymmetric mode grows to a finite amplitude, a subharmonic resonance mechanism that leads to pairing develops two wavelengths from the jet exit. The axisymmetric and helical modes interact nonlinearly, generating numerous sum and difference modes. With the strong growth of the subharmonic mode, a secondary set of nonlinear interactions develops between the subharmonic mode and the above modes. A strong near-field pressure is associated with each of these instability modes and is coherent with the velocity fluctuations in the jet over the entire growth and decay regions of each mode. The details of this field reveal that pairing is not responsible for a feedback mechanism. This strong near-field pressure acts as a natural excitation to the jet. When the background disturbance is sufficiently low, a natural coupling is observed at special operating conditions where the initial modes are coupled to the mode observed near the end of the potential core of the jet. GRA

N83-20047# Army Materiel Development and Readiness Command, Alexandria, Va.

FLUERICS 42: SOME COMMONLY USED LAMINAR FLUIDIC GAIN BLOCKS

Tadeusz M. Drzewiecki Sep. 1982 62 p refs

(DA Proj. 1L1-61102-AH-44; HDL Proj. A41234)

(AD-A121430; HDL-TM-82-10) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report presents data and operating experience information on many commonly used laminar gain blocks from two to eight stages. In addition, as an aid to design, a short computer program is presented, suitable for use with a pocket programmable calculator. Outputs from this program are individual stage data including nominal supply pressures and flows and staged gain. Also available is the net gain and the bandwidth at 90 deg of phase shift. Several examples of this program are given to cover multiple-stage gain blocks. As an example of the utility of the program, a step-by-step tradeoff study is presented for the Massachusetts Institute of Technology fluidic servovalve, for which an attempt is made to maximize bandwidth and minimize leakage flow. GRA

N83-20048# Air Force Geophysics Lab., Hanscom AFB, Mass.

HEATER-GENERATED INTERMEDIATE-SCALE IRREGULARITIES: SPATIAL DISTRIBUTION AND SPECTRAL CHARACTERISTICS Environmental Research Papers, Aug. 1980 - Jan. 1981

Robert C. Livingston 22 Jun. 1982 33 p refs

(AFGL Proj. 4643)

(AD-A120866; AFGL-TR-82-0174; AFGL-ERP-781) Avail: NTIS HC A03/MF A01 CSCL 13/1

The first extensive phase scintillation measurements during both over-and underdense heating are described. The data were collected from an aircraft, and by making repeated scans in the vicinity of the heated volume, the overall spatial distribution of intermediate-scale irregularities has been established. During overdense heating, the irregularities maximize in strength near the HF reflection height, but also map downward at least 100 km with only moderate weakening. From the relative frequency shifts of the phase spectra measured for different directions of aircraft motion, the irregularity anisotropy and drift have also been estimated. The change in phase spectra shape between 6.2 MHz and 9.9 MHz overdose heating is consistent with thermal self-focusing irregularity generation. Underdense heating produces a different phase spectral signature than is theoretically predicted, although enhanced energy does occur at scintillation producing scale sizes. Author (GRA)

N83-20049# Scientific Research Associates, Inc., Glastonbury, Conn.

COMPUTATION OF DISCRETE SLANTED HOLE FILM COOLING FLOW USING THE NAVIER-STOKES EQUATIONS Annual Technical Report, 1 Apr. 1981 - 31 Mar. 1982

H. J. Gibeling, S. J. Shamroth, and H. McDonald Jul. 1982 36 p refs

(Contract F49620-78-C-0038; AF Proj. 2307)

(AD-A121796; R82-910002-4; AFOSR-82-1004TR) Avail: NTIS HC A03/MF A01 CSCL 13/1

An analysis and computational procedure were developed to predict flow and heat transfer which results from coolant injection through a single row of round holes oriented at an angle to a flat surface with the injection and free stream velocity vectors coplanar. This method solves the compressible Navier-Stokes equations and utilizes zone embedding, surface oriented coordinates, interactive boundary conditions, and an efficient split LBI scheme. The approach treats the near hole flow region where the film cooling flow is initially established. Prior studies considered only laminar flow to simplify development of the computational procedure. Under the present effort, several turbulence models suitable for the discrete hole film cooling problem were investigated by predicting a number of test cases from the 1980-81 AFOSR-HTTM Stanford Conference on Complex Turbulent Flows. The calculation of a discrete hole film cooling case for an injection angle of 35 degrees has been initiated using a mixing length turbulence model. These results will be compared with the experimental data of Kadotani and Goldstein, a recalculation with either a turbulence kinetic energy/algebraic length scale or a turbulence kinetic energy/ warranted by the data comparison. Author (GRA)

N83-20050# Aeronautical Research Associates of Princeton, Inc., N. J.

DYNAMICAL DETERMINATION OF THE SCALES OF TURBULENCE Final Report, 1 Mar. 1981 - 30 Apr. 1982

Guido Sandri and Coleman duP. Donaldson Apr. 1982 61 p refs

(Contract F49620-81-C-0057; AF Proj. 2307)

(AD-A121776; ARAP-468; AFOSR-82-0985TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

Integral scales for fully developed turbulent flows may be defined as moments of the two-point tensor correlations among the dynamical variables which characterize the flow, for example velocity and temperature. We show in this paper that this concept of integral scales allows for a rigorous derivation of rate equations for the integral scales (at a single point) if two major assumptions are made. The first assumption is that the integral scales are sufficiently small (compared with the scale of spatial variations of the mean quantities) to enable one to neglect the difference between convection at two points separated by less than the integral scale itself. This assumption is necessary to obtain convections of the integral scale (which is a one-point function) at a single point and thus represents the most general physical requirement for the very existence of closed equations for the integral scales. The second major assumption that we find necessary for a rigorous derivation of rate equations for the integral scales stems from a coupling between the evolution of the Reynolds stress and other one-point correlations to the evolution of the integral scale. We observe that we can obtain from the two-point correlations at every space point and at every instant of time, both the Reynolds stress (by collapsing the two points to one), and the integral scale (by a suitable integration in relative separation). GRA

N83-20051# Illinois Inst. of Tech., Chicago. Dept. of Mechanical Engineering.

THREE-DIMENSIONAL EFFECTS OF UNSTEADINESS ON SEPARATED TURBULENT FLOWS Annual Report, 15 Mar. 1981 - 14 Mar. 1982

John L. Way, Robert E. Drubka, and Dennis J. Koga Jul. 1982 9 p refs

(Contract AF-AFOSR-0158-81)

(AD-A121711; AFOSR-82-0984TR) Avail: NTIS

HC A02/MF A01 CSCL 20/4

A series of experiments is undertaken to take advantage of previous work and state-of-the-art experimental investigate techniques to provide information on a wide class of unsteady flows. Primary objectives of the program are to answer basic questions concerning the effects of unsteadiness on the subject flows and to provide data in a form which is useful to theoreticians and numerical analysts. The ultimate goals of this project include providing the engineering designer of various devices which involve unsteady flow and separation with the tools of conceptual mechanisms as well as a bank of useful data. Key mechanisms which have already been discovered suggest that large scale structures caused by flow unsteadiness exhibit gradual phase shift with increasing frequency of oscillation and that they convect with faster relative speed in attached shear layers as compared to their speed in separated layers. Author (GRA)

N83-20052# Rockwell International Corp., Thousand Oaks, Calif. Science Center.

NUMERICAL SIMULATION OF LAMINAR, INCOMPRESSIBLE FLOW WITHIN LIQUID FILLED SHELLS Final Draft Report, 29 Sep. 1980 - 30 Oct. 1981

Sukumar R. Chakravarthy Aberdeen Proving Ground, Md. BRL Nov. 1982 65 p refs

(Contract DAAK11-80-C-0101)

(AD-A121703; AD-F300112; SC5284.2FRD; ARBRL-CR-00491) Avail: NTIS HC A04/MF A01 CSCL 19/1

A numerical simulation capability was developed to analyze fluid flow in liquid filled projectiles. The unsteady, compressible Navier-Stokes equations for laminar flow are solved for the primitive variables. The finite difference approximations to the governing equations are either of first or second order time accuracy, second order spatial accuracy in the axial and radial directions, and fourth order spatial accuracy in the azimuthal direction. The finite difference equations are solved by factorization procedure that permits the choice of reasonably large time steps and avoids limitations based on the magnitude of Reynolds number. The numerical simulations methodology considered provides a complete, accurate and flexible framework for the computational analysis of fluid behavior in liquid filled projectiles. Two computer programs were developed. The cartesian velocity components and pressure are the dependent variables in the first along with a cartesian base coordinate system. The second computer program is cast with cylindrical velocity components in cylindrical coordinates and is limited to a cylindrical geometry. Both these programs are applicable to three dimensional flow and both codes can be flagged to compute axisymmetric flow efficiency by avoiding calculations involving the extra coordinate. GRA

N83-20053# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.

UNSTEADY TURBULENT BOUNDARY LAYERS IN ADVERSE PRESSURE GRADIENTS Interim Report

Eugene E. Covert and Peter F. Lorber Jun. 1982 14 p refs Presented at the AIAA/ASME Joint Thermophys., Fluids, Plasma and Heat Transfer Conf., St. Louis, Mo., 7-11 Jun. 1982 Previously announced as A82-31937

(Grant AF-AFOSR-0282-80; AF Proj. 2307)

(AD-A121691; AFOSR-82-1006TR) Avail: NTIS HC A02/MF A01 CSCL 20/4

A number of characteristics of an unsteady turbulent boundary layer have been measured on the after part of the upper surface of an 0012 airfoil (X/c = 0.69 and 0.94). The data is taken at chord Reynolds number of 700,000 and over a range of reduced frequencies (based upon the semichord) of 0.5 to 6.4. Mean and unsteady velocity profiles, as well as Reynolds stress profiles, are presented, as is the nonlinear coupling from the unsteady motion into the steady motion. Data is presented and discussed which shows that for this experiment the periodic unsteady turbulent velocity profile tends toward a universal shape. GRA

N83-20054# United Technologies Research Center, East Hartford, Conn.

FLOW DISTRIBUTION CONTROL CHARACTERISTICS IN MARINE GAS TURBINE WASTE-HEAT RECOVERY SYSTEM. PHASE 2: FLOW DISTRIBUTION CONTROL IN WASTE-HEAT STEAM GENERATORS Annual Technical Report, Jul. 1981 - Jul. 1982

Simion C. Kuo and Ho-Tien Shu Jul. 1982 138 p refs

(Contract N00014-80-C-0476; NR Proj. 097-411)

(AD-A119310; UTRC-R82-955750-4) Avail: NTIS HC A07/MF A01 CSCL 13/10

The effect of flow distribution control on the design and performance of marine gas turbine waste heat steam generators was investigated. Major design requirements and critical problems associated with a waste heat steam generator were reviewed, and an existing two dimensional heat exchanger model based on the compact heat exchanger design criteria and the relaxation approach was modified and updated to estimate the waste heat steam generator performance at any inlet gas flow distribution. Performance estimates were made of the steam generator using uniform velocity distribution, and also actual flow distribution data available (at the diffuser inlet) with and without flow distribution controls, all at design and off design operating conditions of the gas turbine engine. Results indicate that the exit steam temperatures of the baseline waste heat steam generator with and without flow distribution controls would be 725 F and 450 F, respectively, for a constant design flow ratio of 7.9 lb/sec, and for a constant exit temperature of 700 F, the water flow rates would be 8.1 lb/sec and 6.6 lb/sec, respectively. GRA

N83-20055# Massachusetts Inst. of Tech., Cambridge. Gas Turbine and Plasma Dynamics Lab.

CURRENT PROBLEMS IN TURBOMACHINERY FLUID DYNAMICS Semiannual Report, 1 Oct. 1981 - 30 Apr. 1982

Edward M. Greitzer, William T. Thompkins, Jr., James E. McCune, Alan H. Epstein, and Choon S. Tan 21 May 1982 39 p refs

(Contract F49620-82-K-0002; AF Proj. 2307)

(AD-A122405; AFOSR-82-1051TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

A multi-investigator program on problems of current interest in turbomachinery fluid dynamics is being conducted at the M.I.T. Gas Turbine & Plasma Dynamics Lab. Within the scope of this effort, four different tasks, encompassing both design and off-design problems, have been identified. These are: (1) investigation of fan and compressor design point fluid dynamics (including formation of design procedures using current three-dimensional transonic codes and development of advanced measurement techniques for use in transonic fans); (2) studies of basic mechanisms of compressor stability enhancement using compressor casing/hub treatment; (3) fluid mechanics of inlet vortex flow distortions in gas turbine engines; and (4) investigations of three-dimensional flows in highly loaded turbomachines (including blade-to-blade flow analysis and numerical computations of secondary flow in a bend using spectral methods. In addition to these tasks this investigator effort also includes the Air Force Research in Aero Propulsion Technology (AFRAPT) Program.GRA

N83-20056# Naval Research Lab., Washington, D. C.

A CONSERVATION-OF-VELOCITY LAW FOR INVISCID FLUIDS

James M. Witting and B. Edward McDonald 21 Mar. 1982 16 p refs

(AD-A122186; NRL-MR-4977) Avail: NTIS HC A02/MF A01 CSCL 20/4

The Euler equations for an inviscid barotropic fluid (rho = rho)(p) lead to a conversation law for the tangential component of surface velocity. The conservation law has been invoked in an approximate way in the past without having been explicitly stated. Here we derive the general form of the conservation law and, for irrotational flows, point out its relation to Bernouli's law. We then illustrate its use in a nonlinear surface wave model and compare results with experimental profiles for solitary waves in converging/diverging channels. The Korteweg-deVries theory originally used to interpret the experiment does not account for some features seen in the data, such as an oscillatory tail produced when a solitary wave moves through a diverging channel. By contrast,

results given here, which derive from a model that explicitly conserves mass and velocity, faithfully reproduce the prominent features of the experiment. GRA

N83-20057# Massachusetts Inst. of Tech., Cambridge.
THE EFFECTS OF STREAMWISE CONCAVE CURVATURE ON TURBULENT BOUNDARY LAYER STRUCTURE Interim Technical Report
Albert H. Jeans and James P. Johnston Jun. 1982 162 p refs Prepared in cooperation with Stanford Univ.
(Contract F49620-80-C-0010; AF Proj. 2307)
(AD-A122303; AFOSR-82-1015TR) Avail: NTIS HC A08/MF A01 CSCL 20/4

Concave curvature has a relatively large, unpredictable effect on turbulent boundary layers. Some, but not all previous studies suggest that a large-scale, stationary array of counter-rotating vortices exists within the turbulent boundary layer on a concave wall. The objective of the present study was to obtain a qualitative model of the flow field in order to increase our understanding of the underlying physics. A large free-surface water channel was constructed in order to perform a visual study of the flow. Streamwise components of mean velocity and turbulence intensity were measured using a hot film anemometer. The upstream boundary was spanwise uniform with a momentum thickness to radius of curvature of 0.05. Compared to flat wall flow, large-scale, randomly distributed sweeps and ejections were seen in the boundary layer on the concave wall. The sweeps appear to suppress the normal mechanism for turbulence production near the wall by inhibiting the bursting process. The ejections appear to enhance turbulence production in the outer layers as the low speed fluid convected from regions near the wall interacts with the higher speed fluid farther out. The large-scale structures did not occur at fixed spanwise locations, and could not be called roll cells or vortices. Author (GRA)

N83-20058# Pennsylvania State Univ., University Park. Applied Research Lab.
AN ALGEBRAIC TURBULENCE MODEL MODIFIED FOR EXTRA RATES OF STRAIN IN AN AXISYMMETRIC BOUNDARY LAYER
G. H. Hoffman 30 Sep. 1982 62 p refs
(Contract N00024-79-C-6043)
(AD-A122232; ARL/PSU/TM-82-201) Avail: NTIS HC A04/MF A01 CSCL 20/4

A standard two-piece algebraic turbulence model is modified to account for transverse and longitudinal extra rates of strain which are important in the tail region of an axisymmetric boundary layer. The modified model contains one empirical constant which is determined with the aid of experimental data. For three bodies of revolution having different longitudinal curvature histories, boundary layer solutions with the modified and unmodified models are compared with detailed measurements. Incorporation of the two extra rates of strain is found to considerably improve agreement with the data in the tail region. GRA

N83-20059# Polytechnic Inst. of New York, Brooklyn. Dept. of Mechanical and Aerospace Engineering.
EFFECTS OF MASS TRANSFER ON TRANSITION BEHAVIOR AT HIGH SPEEDS
Peter Plostins and Robert J. Cresci Jun. 1982 47 p refs
(Grant AF-AFOSR-0018-81)
(AD-A122228; POLY-M/AE-82-9; AFOSR-82-1030TR) Avail: NTIS HC A03/MF A01 CSCL 16/3

Surface heat transfer and boundary layer transition measurements have been performed on a slender blunted cone at M sub infinity = 8.0. These measurements have been obtained on the conical surface with mass transfer occurring on the spherical nose cap. The free stream Reynolds number, based on nose radius, varied between 6000 and 90000. Data were obtained both at zero angle of attack and at angles as high as 14 degrees, which exceeds the semivertex cone angle of 10 degrees. The technique utilized in the determination of transition location was the observation of the RMS output of a thin film gauge, imbedded in the model surface, and maintained at a constant temperature by an anemometer system. A sudden change in the RMS output of the film gauge was found to accurately locate the onset of boundary layer transition. GRA

N83-20060# Oak Ridge National Lab., Tenn. Energy Div.
CONCEPTUAL DESIGN AND PERFORMANCE ANALYSIS OF ABSORPTION HEAT PUMPS FOR WASTE-HEAT UTILIZATION
Gershon Grossman and Horacio Perez-Blanco 1982 15 p refs Presented at the Semiannual Meeting of the Am. Soc. of Heating, Refrigerating, and Air Conditioning Engrs., Houston, Tex., 24 Jan. 1982
(Contract W-7405-eng-26)
(DE82-010202; CONF-820112-4) Avail: NTIS HC A02/MF A01

The purpose of the study is to explore the potential of the absorption cycle for recovering low-temperature waste heat (60 C) as a first step toward the construction of a working system to provide process heat. The system is considered with lithium chloride (LiCl-) and lithium bromide(LiBr-) water solutions as working fluids. The benefits of multistaging for achieving large temperature boosts are shown. The performance criteria are defined by means of parameters that are relevant to the operation of a waste-heat-actuated cycle. Components and overall system performance of a two-stage heat pump are calculated and the results are discussed. DOE

N83-20061# Iowa Inst. of Hydraulic Research, Iowa City.
A POROUS WAVEMAKER THEORY
Allen T. Chwang Oct. 1982 31 p refs
(Grant NSF CEE-80-20564)
(PB83-111591; IIHR-255) Avail: NTIS HC A03/MF A01 CSCL 20D

A porous wavemaker theory is developed to analyze small amplitude surface waves on water of finite depth, produced by horizontal oscillations of a porous, vertical plate. Analytical solutions in closed forms are obtained for the surface wave profile, the hydrodynamic pressure distribution and the total force on the wavemaker. The influence of the wave effect parameter C and the porous effect parameter G, both being dimensionless, on the surface waves and on the hydrodynamic pressures is discussed. GRA

N83-20062# Argonne National Lab., Ill. Materials Science Div.
DEVELOPMENT OF NONDESTRUCTIVE-EVALUATION TECHNIQUES FOR HIGH-TEMPERATURE CERAMIC HEAT-EXCHANGER COMPONENTS Annual Report, Oct. 1980 - Sep. 1981
D. S. Kupperman, D. Yuhas, T. E. Michaels (Sonoscan, Inc., Bensenville, Ill.), and J. E. Michaels (JTM Systems and Consulting, Inc., Ithaca, N.Y.) Jan. 1982 67 p refs
(Contract W-31-109-eng-38)
(DE82-012603; ANL/FE-82-2; AR-4) Avail: NTIS HC A04/MF A01

An assessment was made of ultrasonic techniques developed to date for nondestructive evaluation of SiC heat exchanger tubes. The results suggest that ultrasonic inspection is a useful and valuable technique for inspecting these tubes, including ceramic butt joints. However, this method alone is currently not sufficiently effective to detect all critical flaws because of (1) the difficulties in following the surface of an out of round tube; (2) the high velocity and thus the large angle of refraction of sound in SiC, which for small diameter tubes leads to significant beam distortion; and (3) insuffient resolution, relative to the small critical flaw size in ceramics, at conventional ultrasonic testing frequencies. The experiments show that higher frequencies (up to 35 MHz) are required for effective wall thickness measurements and detection of laminar type flaws. DOE

N83-20063# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Mechanical Engineering.
FLOW AND COMBUSTION CHARACTERISTICS OF A 2-DIMENSIONAL SPOUTED BED
R. F. Sawyer, J. R. Hart, and K. Ohtake Mar. 1982 26 p refs

Presented at the Spring Meeting of the Western States Section of the Combust. Inst., Salt Lake City, 5-6 Apr. 1982
(Contract DE-AC03-76SF-00098)
(DE82-012907; LBL-14242; CONF-820403-5) Avail: NTIS HC A03/MF A01

A two dimensional spouted bed laboratory combustor was designed and constructed with the objective of studying the interaction among the gas flow, particle flow, and combustion. The facility, designed for a maximum thermal power of 20 kW, has a quartz front wall providing full optical access to particle flows and combustion processes. The combustor was characterized in terms of pressure, temperature, gas velocity, and particle velocity profiles and operating limits. Initial studies employed premixed propane and air and a fixed bed height, bed material, injector slot width, and combustor geometry. As in previous investigations of axisymmetric spouted beds, the ratio of particle mass circulation rate to jet mass flow rate was observed to be about ten. Combustion increased this ratio by about 10%. A pulsating mode of operation was noted with a characteristic frequency of about 10 Hz, controlled by the interaction of the particle and gas flows. DOE

N83-20064# Virginia Univ., Charlottesville. School of Engineering and Applied Science.
IMPACT-PROBE RAREFACTION EFFECTS MEASURED IN CO2: FREE-JET EXPANSIONS M.S. Thesis
Gary Allen Graybeal 23 Mar. 1982 132 p refs
(Contract DE-AC05-82OR-20900)
(DE82-014481; UVA-ER-741-82U) Avail: NTIS HC A07/MF A01

Deviations from ideal behavior for impact probes placed in low density, supersonic CO2 flows are measured. Experiments are conducted in a cryopumped free jet type wind tunnel using two different test configurations. Simple open-ended, nonsharpened, high ID/OD, high length to diameter probes are employed. Flow stagnation temperatures and probe tip temperatures are approximately equal (and approximately ambient). The data cover a range of Mach number M from approximately 3 to 14, and a range for a modified probe Reynolds number from 0.3 to approximately 1000, with d the probe outside diameter and conditions 1 and 2 evaluated upstream and downstream of the probe bow shock wave, respectively. Ratios of measured to ideal impact pressure, p/sub i/, range from approximately 0.95 to 3.3, where the ideal impact pressure is that predicted by the Rayleigh pitot formula. DOE

N83-20065# Los Alamos Scientific Lab., N. Mex.
NUMERICAL AND EXPERIMENTAL INVESTIGATION OF SIMULATED EXPLOSIONS INSIDE A FLOW NETWORK
P. K. Tang, W. S. Gregory, and C. Ricketts (New Mexico State Univ., Las Cruces) May 1982 13 p refs
(Contract W-7405-eng-36)
(DE82-016243; LA-9340-MS) Avail: NTIS HC A02/MF A01

The results of a numerical and an experimental study of a flow network subjected to a simulated explosion are presented. The numerical simulation uses a computer code called EVENT that predicts the response of a system under gas dynamic stress conditions. The results from these two are compared using a flow parameter such as pressure. The numerical calculation matches the results of the experiment quite well. DOE

N83-20066# Oak Ridge National Lab., Tenn.
EFFECT OF LOCATION ON THE PREDICTED PERFORMANCE OF A HEAT-PUMP WATER HEATER
William P. Levins 1982 21 p refs Presented at the Semiann. Meeting of the Am. Soc. of Heating, Refrig. and Air Conditioning Engr., Houston, 24 Jan. 1982
(Contract W-7405-eng-26)
(DE82-006971; CONF-830112-3) Avail: NTIS HC A02/MF A01

A heat pump water heater (HPWH) extracts energy from the air in the environment. The question arises as to how this energy extraction would affect the house HVAC system if the HPWH were located in a conditioned space of a household. A second question concerns the savings obtained by locating the HPWH in an unconditioned space such as a garage or basement. A computer study of these effects was carried out. Since geography, house construction, type and efficiency of HVAC system, and hot water usage will all affect the effective performance, some of the variables were fixed and some were allowed to vary in the study. The effect of locating the HPWH in the conditioned spaces of houses with a high performance heat pump as well as resistance, gas, and oil heated houses with a high performance electric air conditioner was studied. Bin data for each of 18 US cities were used as input weather data. The monthly inlet supply water temperatures to the water heater f each of the 18 cities are given. DOE

N83-20067# Central Inst. for Industrial Research, Oslo (Norway).
WAVE MODEL: RADIOMETRY AND COHERENCE FOR QUASI-HOMOGENEOUS, SCALAR WAVEFIELDS
Hans Pedersen 12 Oct. 1981 45 p refs
(PB83-100628; Rept-78-04-09-7; ISBN-82-7267-394-9) Avail: NTIS HC A03/MF A01 CSCL 20D

On the basis of Wolf's wave equations for the propagation of coherence a new, explicit representation of the cross-spectral density function is obtained in terms of a generalized radiance function which is constant along geometrical rays. By means of a series development of this representation it is shown that the laws of classical radiometry and free space radiative transfer are valid provided the radiance function (the specific intensity) may be considered constant over distances comparable to the transverse coherence length. The corresponding expression for the cross-spectral density function is identical to a result previously obtained that, implies for quasi-homogenous wavefields, the radiance function is everywhere uniquely related to the field coherence by a gereralized van Cittert-Zernike theorem. Author

N83-20068# Central Inst. for Industrial Research, Oslo (Norway).
WAVE MODEL: OSCILLATING CYLINDER IN OCEAN WAVES
Tom L. Lindstrom 15 Mar. 1981 77 p refs
(PB83-100602; Rept-78-04-09-6; ISBN-82-7267-347-9) Avail: NTIS HC A05/MF A01 CSCL 20D

A submerged, circular cylinder moving in small perturbations round an equilibrium position is considered and its impact on water waves is studied. An explicit expression for the velocity potential is obtained in terms of a rapidly converging series. The equation of motion is solved when the cylinder is moving object to a linear force, and the case of a flexible cylinder is briefly discussed. GRA

N83-20069# Central Inst. for Industrial Research, Oslo (Norway).
WAVE DATA: THE MEASUREMENT OF THE REFLECTION AND ATTENUATION COEFFICIENTS FOR WATER WAVES IN A TERMINATED CHANNEL
Gary Hutton 1981 12 p
(PB83-100701; ISBN-82-7267-356-8; Rept-78-04-08-7) Avail: NTIS HC A02/MF A01 CSCL 20D

Measurements of water waves in experimental hydrodynamic basins are often complicated by reflections and frictional attenuation. The mathematics for a method for determining the coefficients of reflection and attenuation in a terminated channel are given. The main assumption is that plane waves are propagating parallel to the sides of a channel. In the case of a wide channel, attenuation will be a small effect and, in the case of a long narrow channel, end reflection may not be observable. The attenuation, as a function of distance, is assumed to be exponential. GRA

N83-20070# Central Inst. for Industrial Research, Oslo (Norway).
WAVE MODEL: PROPAGATION AND FOCUSING OF LINEAR WAVES IN WATER OF CONSTANT DEPTH
Jakob J. Stamnes, Stefen Ljunggren, and Bjorn Spjelkavik 31 Mar. 1981 52 p refs
(PB83-100750; ISBN-82-7267-4041-1; Rept-78-04-09-3) Avail: NTIS HC A04/MF A01 CSCL 20D

Two different methods are presented that describe the propagation of linear waves in water of constant depth. One method is based on the angular spectrum representation and the other on the impulse response integral. The methods are applied to study the properties of water waves in focal regions. The work is

motivated in order to focus on ocean swells for power production purposes. GRA

N83-20071# Central Inst. for Industrial Research, Oslo (Norway).
WAVE MODEL: NONLINEAR FOCUSING OF WATER WAVES IN THE PARAXIAL REGIME. COMPARISON BETWEEN THEORY AND EXPERIMENT
J. J. Stamnes, B. Spjelkavik, S. Ljunggren, and K. Lovaas 12 Aug. 1981 34 p refs
(PB83-100768; Rept-78-04-09-5; ISBN-82-7267-379-7) Avail: NTIS HC A03/MF A01 CSCL 20D

The results of relatively large amplitude focusing experiments are compared with the predictions of both linear and nonlinear theories. These comparisons verify the validity of the nonlinear theory and show some discrepancy between the results of the linear theory and experiments. However, the efficiency of the focusing device as an energy concentrator does not appear to be significantly deteriorated by the nonlinear effects. GRA

N83-20072# Central Inst. for Industrial Research, Oslo (Norway). Oil and Energy Dept.
WAVE MODEL: FLEXIBLE CYLINDER IN OCEAN WAVES
Hans Brodersen 26 Mar. 1982 57 p refs
(PB83-100784; ISBN-82-7267-442-4; Rept-78-04-09-9) Avail: NTIS HC A04/MF A01 CSCL 20D

A circular cylinder is submerged in water. The cylinder is flexible, and is allowed to suffer a small deformation as the waves pass. An expression for the velocity potentials is obtained in terms of a rapidly converging series. The forces on the cylinder are discussed and the equations of motion are solved under the assumption that the cylinder is not far from being completely rigid. GRA

N83-20073# Central Inst. for Industrial Research, Oslo (Norway). Oil and Energy Dept.
WAVE MODEL: A NUMERICAL MODEL FOR THE FRICTIONAL ABSORPTION OF WATER WAVES
G. Hutton 10 Oct. 1981 37 p refs
(PB83-100792; ISBN-82-7267-397-5; Rept-78-04-09-8) Avail: NTIS HC A03/MF A01 CSCL 20D

This report describes a numerical model used to calculate the frictional absorption of power in water waves. An example of a power conversion channel is given and the model is compared to some experimental results. Author (GRA)

N83-20074# Iowa Univ., Iowa City. Inst. of Hydraulic Research.
NONLINEAR HYDRODYNAMIC PRESSURE ON AN ACCELERATING PLATE
Allen T. Chwang Sep. 1982 25 p refs
(Grant NSF CEE-80-20564)
(PB83-105114; IIHR-252) Avail: NTIS HC A02/MF A01 CSCL 20D

Nonlinear theory is developed to determine accurately the hydrodynamic pressure on an accelerating vertical plate. The plate is assumed to move horizontally towards the fluid with an acceleration which may be expressed in a power series in time. The fluid is initially at rest and the plate motion is impulsive. When the horizontal plate displacement is small in comparison with the undisturbed fluid depth, the method of small time expansions is adopted to obtain analytical solutions up to and including the third order velocity potential. The free surface profile of the fluid is also determined. An example for the constant acceleration case is presented to illustrate the method. GRA

N83-20075# Iowa Univ., Iowa City.
ON REFLECTION OF A PLANAR SOLITARY WAVE AT A VERTICAL WALL
Henry Power Meneses and Allen T. Chwang Aug. 1982 35 p refs
(Grant NSF ENG-79-10049)
(PB83-105247; IIHR-251) Avail: NTIS HC A03/MF A01 CSCL 20D

The reflection of a planar solitary wave at a vertical wall is investigated by solving the Boussinesq equations analytically as well as numerically. The analytical solution is obtained by means of the inner-outer expansions technique, while the numerical solution is based on a finite difference scheme. The maximum wave amplitude at the wall and the time at which this maximum amplitude is reached are presented. It is also found that the incident wave does not reflect immediately at the wall as predicted by the linear wave theory. Rather, the wave suffers a time delay, called the phase lag, during the reflection process. This phase lag is found to be inversely proportional to the square root of the initial wave amplitude. As the reflected wave eventually propagates away from the wall, it has a phase shift in comparison with that obtained by the linear wave theory. GRA

N83-20076# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Fluid Dynamics Panel.
FLUID DYNAMICS ASPECTS OF INTERNAL BALLISTICS
1982 61 p refs Meetings Held in St. Louis, France, Shrivenham, England and Colleferro, Italy
(AGARD-AR-172; ISBN-92-835-1439-4) Avail: NTIS HC A04/MF A01

The interior ballistics cycle including the presentation of different models and computer codes used in interior ballistics are discussed. An example of application is given. Furthermore the experimental methods and associated theories are described, which allow the foregoing models to be validated. These methods and theories also yield indispensable input and allow to verification of the computed results. The gaseous outflow from tube launchers, the physical and thermodynamics characteristics of propellant gases are considered. Specific problems encountered in interior ballistics (liquid propellants, behavior of antierosive additives, behavior of solid propellants at high pressures) are given. GRA

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N83-20077# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugfuehrung.
INVESTIGATIONS ON THE LOCK-IN PROBLEM AND THE READOUT TECHNIQUE OF LASER GYROS
Ruediger Rodloff 21 Dec. 1981 110 p refs In GERMAN; ENGLISH summary
(DFVLR-FB81-39) Avail: NTIS HC A06/MF A01

The principal effects of the laser gyro are introduced, and an analytic model is derived to describe the lock in phenomenon which is compared with experimental results. Other topics are related to different readout techniques, especially the single beam readout and the compensation of the induced bias to avoid the lock in effect. Finally some results of an experimental laser gyro are presented. S.L.

N83-20078*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REMOTE SENSING OF SEDIMENT AND CHLOROPHYLL WITH THE TEST-BED AIRCRAFT MULTISPECTRAL SCANNER
David E. Bowker, Charles A. Hardesty, and Daniel J. Jobson Mar. 1983 26 p refs
(NASA-TM-84590; L-15572; NAS 1.15:84590) Avail: NTIS HC A03/MF A01 CSCL 14B

An instrument known as the test-bed aircraft multispectral scanner (TBAMS) was used in a research flight over the entrance to the Chesapeake Bay. Upwelled radiances from the TBAMS data were correlated with the water parameters, particularly sediment and chlorophyll a. Several algorithms were demon-

strated for monitoring sediment and chlorophyll, with a three-band ratio being the best. The primary advantage of the three-band ratio was found to be its apparent insensitivity to atmospheric and Sun-angle variations. M.G.

N83-20079*# National Aeronautics and Space Administration, Washington, D. C.
SINGLE-PULSE GAS THERMOMETRY AT LOW TEMPERATURES USING TWO-PHOTON LASER-INDUCED FLUORESCENCE IN NO/N2 MIXTURES
K. P. Gross (Stanford Univ., Calif.) and R. L. McKenzie Feb. 1983 16 p refs
(NASA-TM-84329; A-9234; NAS 1.15:84329) Avail: NTIS HC A02/MF A01 CSCL 14B

A technique suitable for measuring fluctuating temperatures in supersonic turbulent flows of N2 seeded with NO has been demonstrated in a nonflowing cell. The method relies on the two photon excitation of two selected ro-vibronic transitions in the NO gamma (alpha 2 sigma+, v prime = 0 yields ch1zp1, v double prime = 0). Author

N83-20080 Royal Aircraft Establishment, Farnborough (England).
IMAGE PROCESSING AND ANALYSIS TECHNIQUES FOR READING KINETHEODOLITE FILM SCALES
Ann M. Bagot Jun. 1982 29 p refs
(BR85461; RAE-TR-82069; IT-179) Copyright. Avail: Issuing Activity

A series of techniques for processing and analysing images are described. Although developed for a specific purpose, namely the automatic reading of angular information on Askania cinetheodolite film, most of the techniques are quite general, and potentially applicable to a wide variety of problems. The processes described include real time binarization of a television signal, production and analysis of projections to determine the positions of features of interest, and character recognition. S.L.

N83-20081*# Bendix Aerospace Systems Div., Ann Arbor, Mich.
SUMS CALIBRATION TEST REPORT Final Report
G. Robertson Mar. 1982 357 p
(Contract NAS1-16073)
(NASA-CR-169964; NAS 1.26:169964; BSR-4491) Avail: NTIS HC A16/MF A01 CSCL 14B

Calibration was performed on the shuttle upper atmosphere mass spectrometer (SUMS). The results of the calibration and the as run test procedures are presented. The output data is described, and engineering data conversion factors, tables and curves, and calibration on instrument gauges are included. Static calibration results which include: instrument sensitive versus external pressure for N2 and O2, data from each scan of calibration, data plots from N2 and O2, and sensitivity of SUMS at inlet for N2 and O2, and ratios of 14/28 for nitrogen and 16/32 for oxygen are given. S.L.

N83-20082*# Southwest Research Inst., San Antonio, Tex.
DESIGN AND DEVELOPMENT OF A FAST ION MASS SPECTROMETER Final Report
J. L. Burch Feb. 1983 158 p refs
(Contract NASw-3237)
(NASA-CR-169988; NAS 1.26:169988) Avail: NTIS HC A08/MF A01 CSCL 14B

Two Fast Ion Mass Spectrometers (FIMS A and FIMS B) were developed. The design, development, construction, calibration, integration, and flight of these instruments, along with early results from the data analysis efforts are summarized. A medium energy ion mass spectrometer that covers mass velocity space with significantly higher time resolution, improved mass resolution, (particularly for heavier ions), and wider energy range than existing instruments had achieved was completed. The initial design consisted of a dual channel cylindrical electrostatic analyzer followed by a dual channel cylindrical velocity filter. The gain versus count rate characteristics of the high current channel electron multipliers (CEM's), which were chosen for ion detection, revealed a systematic behavior that can be used as a criterion for selection of CEM's for long counting lifetimes. S.L.

N83-20083*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE 3-DIMENSIONAL AND TOMOGRAPHIC IMAGING DEVICE FOR X-RAY AND GAMMA-RAY EMITTING OBJECTS Patent Application
Lo I. Yin, inventor (to NASA) Filed 21 Jan. 1983 20 p
(NASA-Case-GSC-12851-1; US-Patent-Appl-SN-459842) Avail: NTIS HC A02/MF A01 CSCL 14B

An instrument for obtaining quantitative, three-dimensional and tomographic information relating to X-ray and gamma-ray emitting objects and for the orthoscopic viewing of such objects includes a multiple-pinhole aperture plate held spaced from an X-ray or gamma-ray to visible-light converter which is coupled to a visible-light image intensifier. The spacing between the aperture plate and the converter is chosen such that the mini-images of an emitting object formed by the pinholes do not substantially overlap as the impinge on the converter. The output of the image intensifier is digitized by a digitizing camera in terms of position and intensity and fed into a digital computer. The computer may output quantitative information relating to the emitting object directly, such as that relating to tomograms, or provide information in analog form when coupled with a suitable viewing device to give an orthoscopic, three-dimensional image of the object. NASA

N83-20084*# National Aeronautics and Space Administration. Pasadena Office, Calif.
TRACE WATER SENSOR Patent Application
James B. Stephens, Mary Yang, and Eric G. Laue, inventors (to NASA) Filed 14 Jan. 1983 12 p
(Contract NAS7-100)
(NASA-Case-NPO-15722-1; US-Patent-Appl-SN-457992) Avail: NTIS HC A02/MF A01 CSCL 14B

A solid electrolytic hygrometer (a gold foil electrode wrapped about a hollow glass cylinder, a sheet of hygroscopic-electrolytic material wrapped the foil, and a wire wound around the outside of the electrolytic sheet) operated with high reliability while providing rapid and sensitive response. Moisture passing between wire turns was absorbed by the electrolytic material, and dissociated by current passed through the electrolytic material. The cylinder had a slit extending along its length, allowed resilient expansion to press the sheet of electrolytic material firmly against the electrodes. Wire turns lying against one another caused rapid dissociation of moisture. Guard wires also lie at opposite ends of the electrolytic sheet, and currents passing through them avoided moisture buildup at the ends of the main wire coil. B.G.

N83-20085# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TEMPERATURE AVERAGING THERMAL PROBE Patent Application
Lou F. Kalil and Victor S. Reinhardt, inventors (to NASA) Filed 31 Jan. 1983 10 p
(NASA-Case-GSC-12795-1; US-Patent-Appl-SN-462508) Avail: NTIS HC A02/MF A01 CSCL 14B

A thermal probe for averaging temperature fluctuations over a prolonged period is formed with a temperature sensor embedded inside a solid object of a thermally conducting material. The solid object is held in a position equidistantly spaced apart from the interior surfaces of a closed housing by a mount made of a thermally insulating material. The housing is sealed to trap a vacuum or mass of air inside and thereby prevent transfer of heat directly between the environment outside of the housing and the solid object. Electrical leads couple the temperature sensor with a connector on the outside of the housing. Other solid objects of different sizes and materials may be substituted for the cylindrically-shaped object to vary the time constant of the probe. NASA

N83-20086# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
IN-FLIGHT CALIBRATION OF THE MONEX HIGH ENERGY

SOLAR X-RAY MONITOR (HEM) ON THE P78-1 SATELLITE
Sharad R. Kane, Peter B. Landecker, and David L. McKenzie 1 Sep. 1982 41 p refs
(Contract F04701-81-C-0082)
(AD-A121790; TR-0082(2940-01)-8; SD-TR-82-67) Avail: NTIS HC A03/MF A01 CSCL 18/4

Simultaneous observations of seven medium and large solar X-ray bursts made with the MONEX High Energy Monitor (HEM) on the P78-1 satellite and the X-ray Spectrometer aboard the ISEE-3 (International Sun Earth Explorer-3) spacecraft have been used to examine the detector gain and response characteristics of the HEM instrument. It has been found that the HEM detector gain decreased by approx. 25% after the launch and subsequently decreased slowly with time. The gain was approx. 72% and approx. 56% of its pre-launch value about 5 weeks and 15 months after the launch, respectively. At total counting rates higher than 10,000 counts/sec there is a large decrease in the detector gain resulting in an apparent counting rate saturation. The overall instrument performance appears to be satisfactory and it is expected that the HEM observations will be useful in the study of many small and medium intensity solar X-ray bursts. Author (GRA)

N83-20087# Air Force Occupational and Environmental Health Lab., Brooks AFB, Tex.
EVALUATION OF PORTABLE, DIRECT-READING COMBUSTIBLE GAS METERS Final Report
Mohammad A. Hossain Sep. 1981 80 p refs
(AD-A121421; OEHL-81-40) Avail: NTIS HC A05/MF A01 CSCL 06/11

The USAF Occupational and Environmental Health Laboratory (USAF OEHL) evaluated eight direct-reading, portable combustible gas meters. The evaluation included determination of linearity of response to a calibration gas, response to several different combustible gases and vapors, including JP-4, and the instrument's capability to measure both fire safe limits (below 20% LEL) and levels of health consequence (below 5% LEL). Recommendations of combustible gas meters for specific application can be made based upon the evaluation results. Author (GRA)

N83-20088# Ballistic Research Labs., Aberdeen Proving Ground, Md.
SIMULATION OF ACTIVE AND PASSIVE MILLIMETER-WAVE (35 GHz) SENSORS BY TIME SERIES ANALYSIS
Denis F. Strenzwilk and Richard T. Maruyama Nov. 1982 60 p refs
(DA Proj. 1L1-62618-AH-80)
(AD-A121702; AD-F300115; ARBRL-MR-03214) Avail: NTIS HC A04/MF A01 CSCL 17/2

Analog voltage signals from a millimeter-wave (MMW) radiometer (passive sensor) and radar (active sensor) were collected over varying grassy terrains at Aberdeen Proving Ground (APG), Maryland in July 1980. These measurements were made as part of continuing studies of MMW sensors for smart munitions. The signals were digitized at a rate of 2,000 observations per second and then analyzed by the Box and Jenkins time series approach. This analysis reports on the characterization of these data sets. The passive time series signals resulted in a simple autoregressive-moving average process, similar to a previous set of data taken at Rome Air Development Center in Rome, N.Y. by Ballistic Research Laboratory. On the other hand, the radar data (active sensor) required a data transformation to enhance the analysis. In both cases the signals were well characterized using the Box-Jenkins time series approach. GRA

N83-20089# WICAT Systems, Inc., Orem, Utah.
VIDEODISC TRAINING DELIVERY SYSTEM PROJECT Final Technical Report, Sep. 1980 - Aug. 1981
Andrew S. Gibbons 1 Jul. 1982 55 p
(Contract DABT60-80-C-0053)
(AD-A121486; TDI-TR-82-5) Avail: NTIS HC A04/MF A01 CSCL 05/9

The rapid development and proliferation of complex technology in all areas of the military has resulted in an increase in paper-based technical documentation that is fast becoming unmanageable. The recognition of this growing problem prompted the establishment of the Army Communicative Technology Office, with one of its missions to explore emerging technology and its application to the documentation delivery requirements of the modern army. The application of technology applied to documentation has a direct effect on training. This project was one of the first joint efforts to explore and use videodisc technology in the US Army training community. The purpose of the project was to prepare a series of seven lessons to be administered by consumer-model videodisc player. This report describes the videodisc courseware development and includes a summary of encountered problems, solutions thereto, and lessons learned. GRA

N83-20090# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Ballistic Research Lab.
EXAMINATION OF OPTICAL HOLOGRAMS BY A SCANNING ELECTRON MICROSCOPE
Charles R. Stumpfel Nov. 1982 26 p refs
(DA Proj. 1L1-61101-A-91A)
(AD-A122335; AD-F300130; ARBRL-MR-03217) Avail: NTIS HC A03/MF A01 CSCL 20/6

Two optical holograms recorded in silver halide photographic emulsions were examined by a scanning electron microscope. Surface relief produced by the light exposure as well as in depth silver fringes (also lightwise) were imaged. Other structure, some of which is periodic, but none of which is known to be produced by the light, is pointed out and possible causes of the patterns mentioned. GRA

N83-20091# Varian Associates, Palo Alto, Calif. Microwave Tube Div.
THE 60 GHz GYROTRON DEVELOPMENT PROGRAM Quarterly Report, Jan. - Mar. 1982
J. F. Shively, L. J. Craig, S. J. Evans, K. L. Felch, L. J. Fox, G. Hu, H. R. Jory, and S. T. Spang 1982 55 p refs
(Contract W-7405-eng-26)
(DE83-000431; ORNL/SUB-79/21453/11; QR-11) Avail: NTIS HC A04/MF A01

The development of a microwave oscillator capable of producing 200 kW of CW power at 60 GHz was studied. Tests on two experimental tubes, X-3R and X-4, were completed during the quarter. X-3R, which included design modifications to the beam tunnel and cavity coupling, produced 200 kW of peak RF output power at 100 ms pulse duration. The tube proved to be easier to operate than previous experimental tubes because of the modifications. The X-4, which used an older RF circuit design, but in a CW configuration, produced 71.5 kW CW. DOE

N83-19767*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Tracking Systems and Applications Section.
DESCRIPTION AND OVERVIEW OF AN INSTRUMENT DESIGNED TO MEASURE LINE-OF-SIGHT DELAY DUE TO WATER VAPOR
G. M. Resch, M. C. Chavez, and N. I. Yamane *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 1-19 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 14B

36 LASERS AND MASERS

Includes parametric amplifiers.

N83-20092*# National Aeronautics and Space Administration. Pasadena Office, Calif.
INTEGRATED OPTO-ELECTRONIC LASER BEAM DEFLECTOR POSITION DETECTOR Patent Application
Joseph Katz (JPL, California Inst. of Tech., Pasadena), James R. Lesh (JPL, California Inst. of Tech., Pasadena), and Richard M. Dickinson, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 15 Nov. 1982 13 p
(Contract NAS7-100)

(NASA-Case-NPO-15943-1; US-Patent-Appl-SN-441898) Avail: NTIS HC A02/MF A01 CSCL 20E

A monolithic integrated optoelectronic circuit chip is disclosed comprising a semiconductor injector laser and a photoelectric sensor. The chip is suitable for use in an optical communication system employing a laser transmitter and an optical detector/receiver. The chip laser is adapted for electronic deflection of the beam. The chip is utilized in conjunction with an external beacon laser disposed at the optical receiver. The photoelectric sensor is adapted to receive light emitted by the beacon laser, and to generate position signal indicative of the angular position of the beacon relative to the chip. An electronic controller is responsive to the position signals and directs the deflection of the beam so that the chip laser beam is aligned with the optical receiver. NASA

N83-20093# RAND Corp., Santa Monica, Calif.
LASER-INDUCED DESTINATION OF HAZARDOUS CHEMICALS: A PRELIMINARY ANALYSIS
Paul F. Morrison and Kathleen A. Wolf Oct. 1982 85 p refs (RAND/N-1834-RC) Avail: NTIS HC A05/MF A01

Technical methods that might prove effective in destroying dangerous chemicals before they leave the plant environment and become subject to regulation are studied. Laser infrared multiphoton dissociation, for decomposing deleterious chemical gases is evaluated. The chlorinated ethylenes and the chlorinated ethanes are emphasized. A detailed method for decomposing chlorinated chemicals in the workplace using a relatively inexpensive CO2 laser is discussed. Results show that CO2 laser photodegradation of vinyl chloride, a chlorinated ethylene, is promising. S.L.

N83-20094# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PHYSICS (SELECTED ARTICLES)
1 Nov. 1982 39 p refs Transl. into ENGLISH from Wuli (China), v. 10, no. 11, Nov. 1981 p 654-660 and 666-671
(AD-A122320; FTD-ID(RS)T-0752-82) Avail: NTIS HC A03/MF A01 CSCL 20/5

Chemical lasers and solid optical thin film structures are discussed. For individual titles, see N83-20095 through N83-20096.

N83-20095# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ADVANCES IN CHEMICAL LASERS
Luo Jingyuan and Hu Shiheng *In its* Phys. (Selected Articles) (FTD-ID(RS)T-0752) 1 Nov. 1982 p 1-18 refs Transl. into ENGLISH from Wuli (China), v. 10, no. 11, Nov. 1981 p 654-660 (For primary document see N83-20094 10-36)
Avail: NTIS HC A03/MF A01 CSCL 20/5

Vibration-rotation, electron jumping and pure rotation based on the jumping modes of the chemical laser vibration are discussed. Author

N83-20096# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ADVANCES IN RESEARCH ON SOLID OPTICAL THIN FILM STRUCTURES **c74**
Zhong Yongan *In its* Phys. (Selected Articles) (FTD-IS(RS)T-0752-82) 1 Nov. 1982 p 19-34 refs Transl. into ENGLISH from Wuli (China), v. 10, no. 11, Nov. 1981 p 666-671 (For primary document see N83-20094 10-36)
Avail: NTIS HC A03/MF A01 CSCL 20/6

Several aspects of the most important advancements in solid optical thin film, structural research; research methods and problems are considered. Author

N83-20097# General Electric Co., Schenectady, N. Y.
LASER RAMAN PROBE DIAGNOSTICS Final Report, 1 Sep. 1975 - 31 Aug. 1979
M. Lapp, C. M. Penney, and S. Warshaw Nov. 1982 10 p refs (Contract N00014-75-C-1143)
(AD-A122073; GE82SRD086) Avail: NTIS HC A02/MF A01 CSCL 21/2

The overall objective of this work is to provide a scientific basis for a new non-perturbing, space and time resolved optical probe of gas temperature and constituency in combustion systems. The major part of the effort is focussed on the development of Raman scattering methods to accomplish this goal. Effort is also directed toward the goal of using other compatible measurement techniques (viz., laser velocimetry) in an integrated probe system for flame characterization. Author (GRA)

N83-20098# General Electric Co., Schenectady, N. Y. Corporate Research and Development Div.
LASER RAMAN PROBE FOR COMBUSTION DIAGNOSTICS Final Report, 16 Apr. 1979 - 29 Apr. 1980
M. Lapp, M. C. Drake, C. M. Penney, and S. Warshaw Nov. 1982 6 p refs
(Contract N00014-79-C-0381; NR Proj. 094-405)
(AD-A122072; Rept-82SRD085) Avail: NTIS HC A02/MF A01 CSCL 21/2

The objective of this work is to apply light scattering diagnostics to the study of a well-defined combustion flow. Product gas densities are measured for a turbulent jet diffusion flame through use of vibrational Raman scattering techniques. These are combined with simultaneous temperature data from Raman scattering and near-simultaneous velocity data from laser velocimetry, to give an integrated probe system for basic flame properties. GRA

N83-20099# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE Ar-N2 TRANSFER LASER
Xu Shanshan and Ji Ge 2 Nov. 1982 9 p refs Transl. into ENGLISH from Dianzi Xuebao (China), v. 9, no. 3, May 1981 p 81-82
(AD-A122014; FTD-ID(RS)T-0981-82) Avail: NTIS HC A02/MF A01 CSCL 20/5

The construction of an Ar-N2 transfer laser pumped by a radial relativistic electron beam is described. It is the first laser of this type made in China. Laser emission at wavelengths 3577 A was obtained simultaneously. The laser output is 3mJ and the energy extraction volume density is 1J/liter. The characteristics of this laser are also studied. GRA

N83-20100# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STUDY OF THERMAL EFFECTS OF THE ACTION OF A GIANT LASER IMPULSE ON THE SURFACE OF OPAQUE SOLID BODIES
Roman Domanski 22 Oct. 1982 23 p refs Transl. into ENGLISH from Arch. Termodyn. (Poland), v. 2, no. 1, 1981 p 17-30
(AD-A122020; FTD-ID(RS)T-1069-82) Avail: NTIS HC A02/MF A01 CSCL 20/5

The duration time, size, rate of disappearance and temperature of a plasma cloud which is formed in front of a surface of an opaque solid body when this surface is struck by an impulse of laser radiation of high power is studied. These results are utilized to verify the boundary conditions of heat transfer in cases of the impulse type input of energy to solid bodies. GRA

N83-20101# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FUNCTIONING OF A METAL-DIELECTRIC-SEMICONDUCTOR-METAL STRUCTURE WITH ELECTROOPTICAL READING IN THE GAS-LASER INFORMATION WRITE/ERASE MODE
N. G. Basov, V. N. Batog, I. N. Kompanets, A. Ye. Krasnov, and V. V. Nikitin 15 Oct. 1982 9 p refs Transl. into ENGLISH from Sb. Kratkiye Soobshch. po Fiz. (USSR), no. 6, Jun. 1972 p 34-39
(AD-A120928; FTD-ID(RS)T-1406-82) Avail: NTIS HC A02/MF A01 CSCL 20/5

The dynamics involved in the recording and erasure of information by a coherent light of an He-Cd laser for an asymmetric structure based on a photosensitive electrooptical Bi12SiO20 crystal were studied. The metal dielectric semiconductor dielectric metal (MDPDM) structures with optical reading and their application

as storage devices for parallel processing of data, and highly sensitive receviers and converters of luminous radiation are discussed. The structure, metal-dielectric-highly resistive semiconductor, has the ability to memorize the effect of the external sources of ionization, accumulating the free charge carriers in the region near the electrode. Electrical voltage is applied to the structure, under the effect of which the carriers drift to the semiconductor dielectric interface, which creates a surface charge which shields the field within the semiconductor and the optical signal is recorded. Optical reading, which does not obliterate the recorded information, can be accomplished by long-wave radiation. GRA

N83-20102# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

MEASUREMENT TECHNIQUES, SELECTED ARTICLES

Hai Lin Yuan, Hwai Ju Chu, Liu Lao, Chen Ming Liu, and Lee Hsu 5 Oct. 1982 23 p refs Transl. into ENGLISH from Jiliang Jishu (China), no. 1, 1982 p 11-18

(AD-A120927; FTD-ID(RS)T-0955-82) Avail: NTIS HC A02/MF A01 CSCL 20/5

The lithium niobate crystal He-Ne laser power stabilizer is introduced. The working principle of this laser power stabilizer is shown. The laser beam from the output of He-Ne laser after passing through a lithium niobate electric light switch is split into two beams by the beam splitter. One beam is used as the light output and the other beam is used as the signal for feedback circuit. It is sent into the photoelectric tube and then passed through a current-voltage converter, comparative amplifier, and differential amplifier to control the flux of the photoelectric switch. When the power of the laser is increased, the power sampled by the beam splitter also increases to raise the output current signal of the photodiode. This current signal produces a rising voltage signal through the use of a current to voltage converter. GRA

N83-20103# General Electric Co., Philadelphia, Pa. Space System Div.

COPPER VAPOR LASER SCALE DEMONSTRATION Interim Report

T. W. Karras 7 Oct. 1982 5 p

(Contract N00014-82-C-0057; DARPA Order 3650)

(AD-A122077) Avail: NTIS HC A02/MF A01 CSCL 20/5

The principal purpose of this program is the demonstration that copper vapor lasers can be scaled to large volumes and pulse energies. A 4 in. ID laser with a projected capability of over 0.25 J per pulse was to be built and tested and a computer simulation model developed. The specific output goal was 25 microjoules per cu cm of active volume. Author (GRA)

N83-20104# Physical Sciences, Inc., Andover, Mass.

PULSED LASER PROPULSION STUDIES. VOLUME 1: THRUSTER PHYSICS AND PERFORMANCE Final Report, 1 Mar. 1978 - 1 Sep. 1981

David I. Rosen, N. H. Kemp, G. Weyl, P. E. Nebolsine, and G. Kothandaraman Oct. 1982 270 p refs

(Contract N00014-78-C-0328; ARPA Order 3176)

(AD-A122038; PSI-TR-184-Vol-1) Avail: NTIS HC A12/MF A01 CSCL 20/5

This report describes experimental and analytical studies on pulsed laser propulsion. Volume I describes thruster performance and phenomenology studies. They include theoretical investigations of laser-induced gas breakdown at 10.6 microns and 0.35 microns, the development of a detailed computer model of the quasi-one dimensional nonsteady flow of real gases in the nozzle, and small-scale thruster performance and absorption physics experiments using pulsed CO2 (10.6 microns) and XeF (0.35 microns) lasers. Volume II contains the results of mission analysis studies to evaluate the system requirements of some candidate defense-related missions for pulsed laser propulsion. These studies address the problem of orbit-to-orbit transfer of satellites, as well as the launch of a vehicle from the Earth. GRA

N83-20105# Letterman Army Inst. of Research, San Francisco, Calif.

COMBAT OCULAR PROBLEMS. SUPPLEMENT

Edwin S. Beatrice Apr. 1982 81 p refs

(AD-A121936) Avail: NTIS HC A05/MF A01 CSCL 06/18

This report is a supplement to Proceedings of Conference conducted October 20-21, 1980. Contents include: (1) ocular effects of relatively eye safe lasers; (2) bioeffects concerning the safe use of GaAs laser training devices; (3) laser flash effects; (4) laser ocular flash effects; and (5) autoradiography of primate retina after Q-switched ruby laser radiation. GRA

N83-20106# Naval Research Lab., Washington, D. C. Applied Optics Branch.

RESULTS OF LASER-CALIBRATED HIGH-RESOLUTION TRANSMISSION MEASUREMENTS AND COMPARISONS WITH BROADBAND TRANSMISSOMETER DATA: SAN NICOLAS ISLAND, CALIFORNIA, MAY 1979 Final Report

J. A. Dowling, S. T. Hanley, J. A. Curcio, G. L. Trusty, T. H. Cosden, K. M. Haught, C. C. Gott, F. A. Tidball, G. B. Matthews, and A. Ackerman 30 Sep. 1982 99 p refs

(SF59551697)

(AD-A121369; NRL-8618) Avail: NTIS HC A05/MF A01 CSCL 04/1

Atmospheric transmission was measured along a 4.07 km overwater path in May 1979 at San Nicolas Island (SNI), California. A deuterium fluoride (DF) laser and a high-resolution Fourier transform spectrometer (FTS) system were used to generate high-quality transmission spectra of the 4.07 km path accurate to + or - 3 to 5% in absolute transmission. Details and procedures used and results obtained in the absolute transmission calibration of the spectra are presented. Path-integrated values for water vapor density have been derived from the FTS spectra and show good agreement with fixed-location dew-point hygrometer measurements. Comparisons of measured DF laser extinction coefficients with calculated molecular absorption values are presented which suggest modifications to existing water vapor continuum absorption models and which also provide a measure of infrared aerosol extinction. The aerosol extinction values thus derived have been found to show little correlation with concurrent measurements of visibility, windspeed, and relative humidity. Comparisons of spectral-band-averaged FTS data with Pacific Missile Test Center broadband transmissometer measurements show good average agreement with significant scatter in the data attributable in part to sizable fluctuations in transmission occurring during the time scales used to acquire the FTS data. Author (GRA)

N83-20107# Austin Research Associates, Inc., Tex.

THEORETICAL STUDIES ON FREE ELECTRON LASERS Annual Technical Report, 1 Aug. 1981 - 31 Jul. 1982

M. N. Rosenbluth, H. Vernon Wong, and B. N. Moore Aug. 1982 200 p refs

(Contract F49620-81-C-0077; ARPA Order 3923)

(AD-A121673; I-ARA-82-U-89; ARA-467; AFOSR-82-0963TR) Avail: NTIS HC A09/MF A01 CSCL 20/5

An analytical and computational study was conducted of certain theoretical questions relating to free electron lasers (FEL's). The study was divided into five tasks: (1) a proper Hamiltonian formulation of the nonlinear equations for gain-expanded FEL's will be made and Liouville's theorem applied to these systems; (2) the analytic theory for gain-expanded FEL's will be extended to include variable property gain expanders as proposed for storage rings; (3) the results of tasks 1 and 2 will be applied, numerically if necessary, to the determination of whether a steady state gain-expanded FEL is compatible with storage ring operation; (4) the gain of a variable pitch wiggler (as a function of signal amplitude and frequency) will be studied using a single particle simulation code; (5) a fully self consistent particle and EM wave (I-D) code, with provisions for treating micro bunches and providing frequency discrimination in order to consider Raman instability effects, will be developed to treat the startup and pulse formation problem for variable pitch wigglers. GRA

N83-20108# Westinghouse Electric Corp., Pittsburgh, Pa. Research and Development Center.

MEASUREMENTS OF SWARM PARAMETERS IN CHLORINE-BEARING MOLECULES Final Report, 15 Aug. 1979 - 31 Dec. 1981

D. K. Davies Wright-Patterson AFB, Ohio AFWAL Aug. 1982 94 p refs

(Contract F33615-79-C-2074)

(AD-A122026; AFWAL-TR-82-2083; DYD-11008-CE) Avail: NTIS HC A05/MF A01 CSCL 20/8

Precision measurements of swarm parameters were measured over an extended range of electron mean energy in chlorine-bearing gases relevant to the xenon chloride excimer laser system. These measurements were accomplished using a pulsed drift tube specifically designed to handle corrosive gases. Experimental measurements of electron drift velocity, attachment and ionization coefficients together with positive and negative ion mobilities were made in pure HCl over the range of E/N (ratio of electric field to gas number density) from 3 to 300 x 10 to the -17th v/sq cm. A set of electron collision cross sections were derived which is consistent with the measured swarm parameters. Combination of this set of cross sections with the known set for nitrogen has resolved an apparent discrepancy in the attachment rate coefficient between the present measurements and other measurements in HCl/N2 mixtures. Measurements of swarm parameters in pure CCl4 were made over the range of E/N from 300 to 950 10 to the -17th v/sq cm. GRA

N83-20109# Cornell Univ., Ithaca, N. Y. Dept. of Chemistry.

LASER AUGMENTED REACTION RATES: APPLICATION TO INTERCONVERSION AND OXIDATION OF THE BORANES Final Report, 12 Feb. 1981 - 1 Sep. 1982

S. H. Bauer and Peter M. Jeffers 15 Nov. 1982 23 p refs

(Contract DAAG29-81-K-0037)

(AD-A122109; DFT-3; ARO-18139.3-CH) Avail: NTIS HC A02/MF A01 CSCL 20/5

The practical utility of low power microwave plasmas for affecting syntheses of useful products was further demonstrated during the first part of the report period. In a microwave discharge low pressure flow reactor, which was previously developed to convert mixtures of trimethoxyborane and hydrogen to the dimethoxy derivative, silicon tetrachloride reacted with hydrogen to generate polycrystalline silicon films. Silicon tetrafluoride can be similarly reduced. Also, very finely divided Si3N4 was produced from mixtures of SiCl4, N2, and H2 when passed through this discharge. The latter portion of the report period as devoted to the study of the chemiluminescence generated when borane adducts (H3BX; X = N (CH3)3; N(C2H5)3; CO; PYR; THF; S(CH3)2) were mixed with excess oxygen atoms (3P). A low pressure flame was developed. Its spectrum is quantitatively recorded and full analyzed. The most prominent band system was the extensive alpha bands of BO. GRA

N83-20110# TRW Defense and Space Systems Group, Redondo Beach, Calif. Free Electron Laser Team.

HIGH EFFICIENCY FREE ELECTRON LASER Final Report, 1 Oct. 1981 - 31 Jul. 1982

G. R. Neil, H. Boehmer, M. Z. Caponi, J. Edighoffer, S. Fornaca, J. Munch, B. Saur, and C. Shih 31 Jul. 1982 94 p refs

(Contract N00014-80-C-580)

(AD-A122143) Avail: NTIS HC A05/MF A01 CSCL 20/5

The results of an experimental program to investigate the free electron laser (FEL) are presented. The experimental results indicate that to the limits of the present sensitivity the FEL is behaving in accordance with theoretical models. This suggests that improving the current and emittance of FEL accelerators will have a profound effect on improving the performance of FELs. GRA

N83-20111# Northwestern Univ., Evanston, Ill. Dept. of Chemistry.

A STUDY OF THE DYNAMICS OF UV LASER PHOTOLYSIS OF NOCl AND NOBr

Mark D. Moser, Eric Weitz, and George C. Schatz Dec. 1982 22 p refs Submitted for publication

(Contract N00014-79-C-0794)

(AD-A122236; TR-8) Avail: NTIS HC A02/MF A01 CSCL 20/5

The photodissociation of NOCl and NOBr using lasers operating at 193 nm (ArF), 249 nm (KrF), 308 nm (XeCl) and 337 nm (N2) has been studied under collisionless conditions by measuring the infrared fluorescence of the NO product. Little difference between the results for NOBr and NOCl was observed, and all results indicate a linear dependence of photodissociation yield on laser power. The extent of NO vibrational excitation observed was quite large in photodissociation utilizing the ArF and KrF laser lines, with states up to V greater than or = 16 observed with ArF up to V greater than or = 14 with KrF. The XeCl and N2 lines produced much less NO excitation, up to V greater than or = 5. Statistical, half-collision and Franck-Condon models of the photodissociation dynamics were studied, with best agreement with experiment for dissociation at 193 and 249 nm being obtained using a Franck-Condon model. An excited potential function for NOCl in which the NO properties were taken to be close to that of NO (4 Pi) was found to predict the shape of the dissociated NO vibrational distribution accurately at both 193 and 249 nm. Photolysis at 308 and 337 nm could also be explained by a Franck-Condon model using the NO(A superscript 2 Pi) state to model the NOCl excited state. Author (GRA)

N83-20112# California Univ., Livermore. Lawrence Livermore Lab. Dept. of Applied Physics.

RESEARCH TO DEFINE ALGORITHMS APPROPRIATE TO A HIGH-DATA-RATE LASER-WAVELENGTH-MEASUREMENT INSTRUMENT Final Report

Robert L. Byer 1 Apr. 1982 79 p refs

(Contract W-7405-eng-48)

(DE82-012811; UCRL-15451) Avail: NTIS HC A05/MF A01

A computer controlled laser wavelength meter is discussed. The optical system of the laser wavelength meter consists of a series of Fabry-Perot interferometers and one high resolution confocal interferometer, preceeded by a one-half meter grating spectrometer. The interferometrically fringes are imaged on linear diode arrays, read into computer memory and processed by an efficient, noise resistant, algorithm which calculates the wavelength. The algorithm fitting routine generates high accuracy fringe fits at a rate of 5 Hz with the LSI 11/2 processor. A 10 Hz fitting rate is expected with the LSI 11/23 processor. Fringes are fit with an rms error of less than + - 0.01. The wavelength meter interferometers are calibrated by a stabilized HeNe laser source with a long term stability of better than + - 1 MHz. DOE

N83-20113# Sandia Labs., Albuquerque, N. Mex. Advanced Laser Technology Div.

LASER SYSTEMS FOR THE COMBUSTION RESEARCH FACILITY: DIANA

C. K. Miller, J. W. Lavasek, and E. D. Jones Mar. 1982 40 p refs

(Contract DE-AC04-76DP-00789)

(DE82-014255; SAND-81-0311) Avail: NTIS HC A03/MF A01

A 5 Joule/pulse, 1.8 micron s pulse width, 10 ppS flashlamp pumped tunable dye laser system, called Diana, was built for experimental use. Design specifications for the system and details of construction are described, and it is noted that performance of the laser meets or exceeds all design criteria. Areas for further performance improvements are discussed, and updates are suggested to enhance system usefulness. DOE

N83-20114# California Univ., Livermore. Lawrence Livermore Lab.

LASER-PLASMA INTERACTION EXPERIMENTS AT LASER WAVELENGTHS OF 1.064 MICRON, 0.532 MICRON AND 0.355 MICRON

E. M. Campbell, W. C. Mead, R. E. Turner, D. W. Phillion, C. E. Max, F. Ze, K. G. Estabrook, G. Tirsell, B. Pruett, and V. C. Rupert 1982 29 p refs Presented at the US/Japan Seminar on Theory and Appl. of Multiple Ionized Plasmas Produced by Laser and Particle Beams, Nara, Japan, 2 May 1982

(Contract W-7405-eng-48)

(DE82-013992; UCRL-87219; CONF-820528-5) Avail: NTIS HC A03/MF A01

Experiments at all three wavelengths included the following: target absorption, stimulated Brillouin scattering, suprathermal electron production, observation of harmonic and half harmonic emission from the plasma as a signature of parametric processes such as 2 omega/sub pe/ and simulated Raman scattering. Comparisons of detailed hydro code and plasma simulation results were presented. DOE

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N83-20115*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CORROSION OF SIMULATED BEARING COMPONENTS OF THREE BEARING STEELS IN THE PRESENCE OF CHLORIDE-CONTAMINATED LUBRICANT

Richard J. Parker, Eric N. Bamberger (GE Co., Cincinnati), and Alex H. Nahm (GE Co., Cincinnati) Washington 1983 20 p refs Proposed for presentation at the Ann. Meeting of the Am. Soc. of Lubrication Engr., Cincinnati, 24-28 Apr. 1983

(NASA-TM-82955; E-1370; NAS 1.15:82955) Avail: NTIS HC A02/MF A01 CSCL 11F

Corrosion tests were run with AISI 52100, AISI M-50 and AMS 5794 under conditions that simulate the crevice corrosion found in aircraft ball and roller bearings rejected at overhaul for corrosion. Test specimens were fabricated that simulated the contacts of balls or rollers and the raceways. Corrosion cells were assembled in the presence of a lubricant contaminated with water and chloride ions. The cell was then thermally cycled between 339 K (150 F) and 276 K (37 F). The corrosion observed after 14 cycles was that of crevice and pitting corrosion typically found in aircraft bearings. AMS 5749 showed a very slight amount of corrosion. No appreciable differences were noted between AISI 52100 and AISI M-50, but both showed much greater corrosion than AMS 5749. The corrosion pits observed in AISI M-50 appeared to be fewer in number but generally deeper and larger than in AISI 52100. S.L.

N83-20116*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TRACTION BEHAVIOR OF TWO TRACTION LUBRICANTS

S. H. Loewenthal and D. A. Rohn 1983 21 p refs Proposed for presentation at the Ann. Meeting of the Am. Soc. of Lubrication Engr., Houston, 24-29 Apr. 1983

(NASA-TM-83311; E-1507; NAS 1.15:83311) Avail: NTIS HC A02/MF A01 CSCL 11H

In the analysis of rolling-sliding concentrated contacts, such as gears, bearings and traction drives, the traction characteristics of the lubricant are of prime importance. The elastic shear modulus and limiting shear stress properties of the lubricant dictate the traction/slip characteristics and power loss associated with an EHD contact undergoing slip and/or spin. These properties can be deducted directly from the initial slope m and maximum traction coefficient micron of an experimental traction curve. In this investigation, correlation equations are presented to predict m and micron for two modern traction fluids based on the regression analysis of 334 separate traction disk machine experiments. The effects of contact pressure, temperature, surface velocity, ellipticity ratio are examined. Problems in deducing lubricant shear moduli from disk machine tests are discussed. Author

N83-20117*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PRECISION OPTICAL ANGULAR POSITION MARKER SYSTEM FOR ROTATING MACHINERY

John P. Barranger Feb. 1983 12 p refs

(NASA-TM-83062; E-1533; NAS 1.15:83062) Avail: NTIS HC A02/MF A01 CSCL 13I

An optical system is described which generates one or more markers of the angular shaft position of rotating machinery. The system consists of a light source, an optical cable, a machinery mounted lens assembly, a light detector, and a signal conditioner. Light reflected by targets on the rotor is converted to a digital output signal. The system is highly immune to extreme environments of vibration and temperature and achieved a 0.002 percent precision under operational test conditions. Author

N83-20118*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ASSESSMENT OF LUBRICATED CONTACTS: MECHANISMS OF SCUFFING AND SCORING

A. Dyson (Wychwood, Birkenhead Merseyside, England) and L. D. Wedeven Feb. 1983 18 p refs

(NASA-TM-83074; E-1478; NAS 1.15:83074) Avail: NTIS HC A02/MF A01 CSCL 11H

Scoring and scuffing are defined as two distinct but related forms of failure of hardened ferrous components lubricated by liquids. Experimental observations of these phenomena are described, and criteria for scoring and scuffing are discussed. The mechanisms proposed by various authors to explain these observations are enumerated. The view presented here is that, under conditions yet to be defined, scoring is a gradual breakdown of the lubrication of interacting asperities, such lubrication being boundary or microelastohydrodynamic in nature, or a mixture of the two. The final scuffing stage represents a breakdown of the main elastohydrodynamic system, but this may be triggered by the deterioration in surface topography as a result of scoring. An extension of published theoretical treatment of elastohydrodynamic breakdown is proposed, and a critical experiment to assess the importance of edge effects in band contacts is suggested. The practical implications of the proposed mechanism are reviewed, and recommendations for further work are made. A possible thermal instability mechanism for the breakdown of boundary lubrication is outlined. Author

N83-20119*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ADVANCED POWER TRANSMISSION TECHNOLOGY

George K. Fischer, ed. Jan. 1983 541 p refs Proc. of symp. held in Cleveland, Ohio, 9-11 Jun. 1981 Sponsored in cooperation with Army Aviation Research and Development Command

(NASA-CP-2210; E-817; NAS 1.55:2210; AVRADCOM-TR-82-C-16) Avail: NTIS HC A23/MF A01 CSCL 13I

Technology overviews, advanced transmission concepts, rolling-element bearing technology, traction drive technology, spiral bevel gear technology, and spur gear technology are discussed. For individual titles, see N83-20120 through N83-20150.

N83-20120*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NASA HELICOPTER TRANSMISSION SYSTEM TECHNOLOGY PROGRAM

Erwin V. Zaretsky *In its* Advanced Power Transmission Technol. Jan. 1983 p 15-34 refs (For primary document see N83-20119 10-37)

Avail: NTIS HC A23/MF A01 CSCL 01C

The purpose of the NASA Helicopter Transmission System Technology Program is to improve specific mechanical components and the technology for combining these into advanced drive systems to make helicopters more viable and cost competitive for commerical applications. The history, goals, and elements of the program are discussed. Author

N83-20121*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PRESENT TECHNOLOGY OF ROLLING-ELEMENT BEARINGS

Richard J. Parker *In its* Advanced Power Transmission Technol. Jan. 1983 p 35-47 refs (For primary document see N83-20119 10-37)

Avail: NTIS HC A23/MF A01 CSCL 13I

The present technology of rolling-element bearings, the barriers and limits which currently exist, and some of the future requirements that will demand further advancements are identified. Author

N83-20122*# Army Research and Technology Labs., Cleveland, Ohio. Propulsion Lab.

GEARED POWER TRANSMISSION TECHNOLOGY

John J. Coy *In* NASA. Lewis Research Center Advanced Power Transmission Technol. Jan. 1983 p 49-77 refs (For primary document see N83-20119 10-37)

Avail: NTIS HC A23/MF A01 CSCL 13I

The historical path of the science and art of gearing is reviewed. The present state of gearing technology is discussed along with examples of some of the NASA-sponsored contributions tc gearing technology. Future requirements in gearing are summarized. Author

N83-20123*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A HISTORICAL PERSPECTIVE OF TRACTION DRIVES AND RELATED TECHNOLOGY

Stuart H. Loewenthal *In its* Advanced Power Transmission Technol. Jan. 1983 p 79-108 refs (For primary document see N83-20119 10-37)

Avail: NTIS HC A23/MF A01 CSCL 13I

The evolution of traction-drive technology, in a limited sense, is traced from its early development to the efforts underway today. Author

N83-20124*# United Technologies Corp., Stratford, Conn. Aircraft Div.

AN OVERVIEW OF ADVANCEMENTS IN HELICOPTER TRANSMISSION DESIGN

Joseph H. Mancini *In* NASA. Lewis Research Center Advanced Power Transmission Technol. Jan. 1983 p 109-122 (For primary document see N83-20119 10-37)

(Contracts NAS3-17859; DAAJ02-76-C-0044)

Avail: NTIS HC A23/MF A01 CSCL 01C

Development of a high temperature operating helicopter gearbox is discussed. Author

N83-20125*# Bell Helicopter Co., Fort Worth, Tex.

DESIGN OF AN ADVANCED 500-HP HELICOPTER TRANSMISSION

Charles E. Braddock and Roy A. Battles *In* NASA. Lewis Research Center Advanced Power Transmission Technol. Jan. 1983 p 123-140 refs (For primary document see N83-20119 10-37)

(Contract NAS3-21595)

Avail: NTIS HC A23/MF A01 CSCL 01C

High contact ratio spar gears planetary, spiral besel gears, bearings, investment-cast planet carrier, and investment cast stainless-steel housings are discussed. Author

N83-20126*# Transmission Research, Inc., Cleveland, Ohio.

HELICOPTER TRANSMISSION ARRANGEMENTS WITH SPLIT-TORQUE GEAR TRAINS

G. White *In* NASA. Lewis Research Center Advanced Power Transmission Technol. Jan. 1983 p 141-150 refs Presented at the 1st European Rotocraft and Powered Lift Aircraft Forum, Southampton, England, Sep. 1975 (For primary document see N83-20119 10-37)

Avail: NTIS HC A23/MF A01 CSCL 01C

As an alternative to component development, the case for improved drive-train configuration is argued. In particular, the use of torque-splitting gear trains is proposed as a practicable means of improving the effectiveness of helicopter main gearboxes. Author

N83-20127*# Transmission Technology Co., Inc., Fairfield, N. J.

DESIGN STUDY OF SELF-ALINING BEARINGLESS PLANETARY (SABP) GEAR

D. J. Folenta *In* NASA. Lewis Research Center Advanced Power Transmission Technol. Jan. 1983 p 151-160 refs (For primary document see N83-20119 10-37)

(Contract NAS3-21604)

Avail: NTIS HC A23/MF A01 CSCL 13I

The feasibility of using the self alining, bearingless planetary (SABP) transmission in an uprated version of the OH-58 helicopter was evaluated, specific performance comparisons of this new transmission with contemporary helicopter transmission systems and with the uprated version of the OH-58 power transmission were made. Author

N83-20128*# Transmission Research, Inc., Cleveland, Ohio.

HYBRID GEARED TRACTION TRANSMISSIONS

A. L. Nasvytis and G. White *In* NASA. Lewis Research Center Advanced Power Transmission Technol. Jan. 1983 p 161-172 refs (For primary document see N83-20119 10-37)

(Contracts NAS3-20812; NAS3-22108; NAS3-22120)

Avail: NTIS HC A23/MF A01 CSCL 13I

The basic configuration of geared traction drives, geometric and structural factors to be considered in their construction, and current work on hybrid helicopter transmissions rated at 500 and 3000 hp are discussed. Author

N83-20129*# General Electric Co., Cincinnati, Ohio.

IMPACT OF NASA-SPONSORED RESEARCH ON AIRCRAFT TURBINE ENGINE BEARING SPECIFICATIONS

A. H. Nahm *In* NASA. Lewis Research Center Advanced Power Transmission Technol. Jan. 1983 p 173-184 refs (For primary document see N83-20119 10-37)

Avail: NTIS HC A23/MF A01 CSCL 20E

The advancement of the state-of-the-art in aircraft bearing materials technology is reviewed. Current specifications and design practices resulting from NASA-sponsored programs are included. Author

N83-20130*# SKF Industries, Inc., Philadelphia, Pa.

PREDICTION OF BALL AND ROLLER BEARING THERMAL AND KINEMATIC PERFORMANCE BY COMPUTER ANALYSIS

Juris Pirvics and Robert J. Kleckner *In* NASA. Lewis Research Center Advanced Power Transmission Technol. Jan. 1983 p 185-202 refs (For primary document see N83-20119 10-37)

Avail: NTIS HC A23/MF A01 CSCL 13I

Characteristics of good computerized analysis software are suggested. These general remarks and an overview of representative software precede a more detailed discussion of load support system analysis program structure. Particular attention is directed at a recent cylindrical roller bearing analysis as an example of the available design tools. Selected software modules are then examined to reveal the detail inherent in contemporary analysis. This leads to a brief section on current design computation which seeks to suggest when and why computerized analysis is warranted. An example concludes the argument offered for such design methodology. Finally, remarks are made concerning needs for model development to address effects which are now considered to be secondary but are anticipated to emerge to primary status in the near future. Author

N83-20131*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PREDICTED AND EXPERIMENTAL PERFORMANCE OF LARGE-BORE HIGH-SPEED BALL AND ROLLER BEARINGS

Harold H. Coe *In its* Advanced Power Transmission Technol. Jan. 1983 p 203-220 refs (For primary document see N83-20119 10-37)

Avail: NTIS HC A23/MF A01 CSCL 13I

The values of inner and outer race temperature, cage speed, and heat transferred to the lubricant or bearing power loss, calculated using the computer programs Shaberth and Cybean, with the corresponding experimental data for the large bore ball and roller bearings were compared. After the development of computer program, it is important that values calculated using such program are compared with actual bearing performance data to assess the programs predictive capability. Several comprehensive computer programs currently in use are capable of

predicting rolling bearing operating and performance characteristics. These programs accept input data of bearing internal geometry, bearing material and lubricant properties, and bearing operating conditions. The programs solve several sets of equations that characterize rolling element bearings. The output produced typically consists of rolling element loads and Hertz stresses, operating contact angles, component speed, heat generation, local temperatures, bearing fatigue life, and power loss. Two of these programs, Shaberth and Cybean were developed. E.A.K.

N83-20132*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LUBRICATION OF 35-MILLIMETER-BORE BALL BEARINGS OF SEVERAL DESIGNS TO 2.5 MILLION DN
Fredrick T. Schuller *In its* Advanced Power Transmission Technol. Jan. 1983 p 221-238 refs (For primary document see N83-20119 10-37)
Avail: NTIS HC A23/MF A01 CSCL 13I

Parametric tests were conducted with 35mm bore, angular contact ball bearings with either a single or double outer and guided cage. The bearings were either lubricated by oil jets or employed inner ring lubrication. Outer ring cooling was added in selected tests. Lubricant flow to the bearing ranged from 300 to 1900 cc/min. All bearings were successfully run at speeds to 2.5 million DN. Increasing the lubricant flow decreased bearing ring temperatures but increased bearing power lines. The power loss and race temperatures of a jet lubricated with double outer land guided cage were always higher than those of the single land guided design at similar test conditions. The lowest bearing operating temperatures were achieved when inner ring lubrication and outer ring cooling were combined. It is found that cage slip of a double outer land guided cage is approximately twice that of a single outer land guided cage. E.A.K.

N83-20133*# SKF Industries, Inc., Philadelphia, Pa.
HIGH SPEED SPHERICAL ROLLER-BEARING ANALYSIS AND COMPARISON WITH EXPERIMENTAL PERFORMANCE
Robert J. Kleckner and George Dyba *In* NASA. Lewis Research Center Advanced Power Transmission Technol. Jan. 1983 p 239-252 refs (For primary document see N83-20119 10-37)
(Contract NAS3-20824)
Avail: NTIS HC A23/MF A01 CSCL 13I

The capabilities of a spherical roller bearing analysis/design tool, Spherbean (spherical bearing analysis) are described. Capabilities of the analysis are demonstrated and verified by comparison with experimental data. A practical design problem is presented where the computer program is used to improve a particular bearing's performance. E.A.K.

N83-20134*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LARGE-BORE TAPERED-ROLLER BEARING PERFORMANCE AND ENDURANCE TO 2.4 MILLION DN
Richard J. Parker *In its* Advanced Power Transmission Technol. Jan. 1983 p 253-270 refs (For primary document see N83-20119 10-37)
Avail: NTIS HC A23/MF A01 CSCL 13I

The operating characteristics and experimental life estimates for 120.65 mm bore tapered roller bearings of two designs under combined radial and thrust loads were determined. A modified standard bearing design was tested at speeds up to 15,000 rpm. A computer optimized, high speed design was tested at speeds up to 20,000 rpm. Both designs were tested at a combined load of 26,700 N (6000 lb) radial load and and 53,400 N (12,000 lb) thrust load. Advanced helicopter transmissions which require the higher-speed capability of tapered-roller bearings also require higher temperature capability (ref. 2). Thus, materials with temperature capabilities higher than the conventional carburizing steels are required. E.A.K.

N83-20135*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EVALUATION OF A HIGH PERFORMANCE, FIXED-RATIO, TRACTION DRIVE
Stuart H. Loewenthal, Neil E. Anderson (Army Research and Technology Labs.), and Douglas A. Rohn *In its* Advanced Power Transmission Technol. Jan. 1983 p 271-284 refs Submitted for publication (For primary document see N83-20119 10-37)
Avail: NTIS HC A23/MF A01 CSCL 13I

A test program was initiated to evaluate the key operational and performance factors associated with the Nasvytis multiroller concept. Two sets of Nasvytis drives, each of slightly geometry, were parametrically tested on a back to back test stand. Initial results from these tests are reported. One of these units was later retrofitted to the power turbine of an automotive gas turbine engine and dynamometer tested. E.A.K.

N83-20136*# Transmission Research, Inc., Cleveland, Ohio.
TRACTION CALCULATIONS AND DESIGN DATA FOR TWO TRACTION FLUIDS
Joseph Leo Tevaarwerk (Applied Tribology, Ltd.) *In* NASA. Lewis Research Center Advanced Power Transmission Technol. Jan. 1983 p 285-298 refs (For primary document see N83-20119 10-37)
(Contract DEN3-35)
Avail: NTIS HC A23/MF A01 CSCL 13I

The rheological properties of the fluid under these certain conditions which precludes the use of most of the conventional instruments for steady state measurement were studied. The only suitable type of instrument is a disk machine where most of the conditions are the same of similar to those in traction drives. From the resulting traction tests, certain models are inferred. To the designer of traction drives, the traction behavior of the fluid under the severe conditions is of utmost importance because of the direct influence that it has on the efficiency, size, and life of a given drive. E.A.K.

N83-20137*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SIZING CRITERIAL FOR TRACTION DRIVES
Douglas A. Rohn, Stuart H. Loewenthal, and John J. Coy (Army Research and Technology Labs.) *In its* Advanced Power Transmission Technol. Jan. 1983 p 299-316 refs (For primary document see N83-20119 10-37)
Avail: NTIS HC A23/MF A01 CSCL 13I

A simplified traction drive fatigue analysis which was derived from the Lundberg-Palmgren theory is measured and the effects of rotational speed, multiplicity of contacts, and variation in the available traction coefficient on traction drive system life, size, and power capacity was investigated. Simplified equations are provided for determining the 90% survival life rating of steel traction drive contacts of arbitrary geometry. References to life modifying factors for material, lubrication, and traction will be made. E.A.K.

N83-20138*# Cincinnati Univ., Ohio.
A BASIS FOR THE ANALYSIS OF SURFACE GEOMETRY OF SPIRAL BEVEL GEARS
Ronald L. Huston and John J. Coy (Army Research and Technology Labs.) *In* NASA. Lewis Research Center Advanced Power Transmisssion Technol. Jan. 1983 p 317-334 refs (For primary document see N83-20119 10-37)
(Grant NsG-3188)
Avail: NTIS HC A23/MF A01 CSCL 13I

Geomtrical procedures helpful in the fundamental studies of the surface geometry of spiral bevel gears are summarized. These procedures are based upon: (1) fundamental gear geometry and kinematics as exposited by Buckingham, et al; (2) formulas developed from differential geometry; and (3) geometrical concepts developed in recent papers and reports on spiral bevel gear surface geometry. Procedures which characterize the geometry so that the surface parametric equations, the principal radii of curvature, and the meshing kinematics are systematically determined are exphasized. Initially, the focus in on theoretical, logarithmic spiral bevel gears as defined by Buckingham. The gears, however, are difficult to fabricate and are sometimes considered to be too straight. Circular-cut spiral bevel gears are an alternative to this.

Surface characteristics of crown circular cut gears are analyzed. E.A.K.

N83-20139*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SPIRAL-BEVEL GEOMETRY AND GEAR TRAIN PRECISION
Faydor L. Litvin (Illinois Univ.) and John J. Coy *In its* Advanced Power Transmission Technol. Jan. 1983 p 335-344 refs (For primary document see N83-20119 10-37)
Avail: NTIS HC A23/MF A01 CSCL 13I

A new aproach to the solution of determination of surface principal curvatures and directions is proposed. Direct relationships between the principal curvatures and directions of the tool surface and those of the principal curvatures and directions of generated gear surface are obtained. The principal curvatures and directions of geartooth surface are obtained without using the complicated equations of these surfaces. A general theory of the train kinematical errors exerted by manufacturing and assembly errors is discussed. Two methods for the determination of the train kinematical errors can be worked out: (1) with aid of a computer, and (2) with a approximate method. Results from noise and vibration measurement conducted on a helicopter transmission are used to illustrate the principals contained in the theory of kinematic errors. E.A.K.

N83-20140*# Garrett Turbine Engine Co., Phoenix, Ariz.
A COMPUTER SOLUTION FOR THE DYNAMIC LOAD, LUBRICANT FILM THICKNESS, AND SURFACE TEMPERATURES IN SPIRAL-BEVEL GEARS
H. C. Chao, M. Baxter, and H. S. Cheng (Northwestern Univ.) *In* NASA. Lewis Research Center Advanced Power Transmission Technol. Jan. 1983 p 345-364 refs (For primary document see N83-20119 10-37)
(Grant NsG-2143)
Avail: NTIS HC A23/MF A01 CSCL 13I

A computer method for determining the dynamic load between spiral bevel pinion and gear teeth contact along the path of contact is described. The dynamic load analysis governs both the surface temperature and film thickness. Computer methods for determining the surface temperature, and film thickness are presented along with results obtained for a pair of typical spiral bevel gears. E.A.K.

N83-20141*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARISON OF SPUR GEAR EFFICIENCY PREDICTION METHODS
Neil E. Anderson (Army Research and Technology Labs.) and Stuart H. Loewenthal *In its* Advanced Power Transmission Technol. Jan. 1983 p 365-382 refs (For primary document see N83-20119 10-37)
Avail: NTIS HC A23/MF A01 CSCL 13I

The predictions of five spur-gear efficiency calculation methods were compared with three sets of test data using different gear geometries. The data and the analysis methods were limited to jet lubricated, ground, spur gears. The data covered a range in pitch line velocity to 1 to 20 m/sec (200 to 4000 ft/min) and K-load factor range of 17 to 1600. S.L.

N83-20142*# Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.
COMPLIANCE AND STRESS SENSITIVITY OF SPUR GEAR TEETH
R. W. Cornell *In* NASA. Lewis Research Center Advanced Power Transmission Technol. Jan. 1983 p 383-402 refs Submitted for publication (For primary document see N83-20119 10-37)
(Contract NAS3-22138)
Avail: NTIS HC A23/MF A01 CSCL 13I

The magnitude and variation of tooth pair compliance with load position affects the dynamics and loading significantly, and the tooth root stressing per load varies significantly with load position. Therefore, the recently developed time history, interactive, closed form solution for the dynamic tooth loads for both low and high contact ratio spur gears was expanded to include improved and simplified methods for calculating the compliance and stress sensitivity for three involute tooth forms as a function of load position. The compliance analysis has an improved fillet/foundation. The stress sensitivity analysis is a modified version of the Heywood method but with an improvement in the magnitude and location of the peak stress in the fillet. These improved compliance and stress sensitivity analyses are presented along with their evaluation using test, finite element, and analytic transformation results, which showed good agreement. S.L.

N83-20143*# Cleveland State Univ., Ohio. Coll. of Engineering.
A METHOD FOR STATIC AND DYNAMIC LOAD ANALYSIS OF STANDARD AND MODIFIED SPUR GEARS
Romualdas Kasuba *In* NASA. Lewis Research Center Advanced Power Transmission Technol. Jan. 1983 p 403-420 refs Sponsored in part by the Army Aviation Research and Technology Labs. (For primary document see N83-20119 10-37)
(Contract NAS3-18547)
Avail: NTIS HC A23/MF A01 CSCL 13I

The mesh stiffness and dynamic load characteristics for several cases of the Normal Contract Ratio and High Contact ratio gearing. The considered contact ratios were grouped in the general range of 1.7,2.0, and 2.3. The HCR gearing is defined by contact ratios equal to or greater than 2.0. The HCR gearing is represented by a group of small pressure angle, fine pitch, and long addendum gearing. S.L.

N83-20144*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN UPDATE ON THE LIFE ANALYSIS OF SPUR GEARS
John J. Coy (Army Research and Technology Labs.), Dennis P. Townsend, and Erwin V. Zaretsky *In its* Advanced Power Transmission Technol. Jan. 1983 p 421-434 refs (For primary document see N83-20119 10-37)
Avail: NTIS HC A23/MF A01 CSCL 13I

An analytical method for predicting surface fatigue life of gears was presented. General statistical methods were outlined, showing the application of the general methods to a simple gear mesh. Experimentally determined values for constants in the life equation were given. Comparison of the life theory with test results and AGMA standards was made. Gear geometry pertinent to life calculations was reviewed. S.L.

N83-20145*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE OPTIMAL DESIGN OF STANDARD GEARSETS
Michael Savage (Akron Univ.), John J. Coy (Army Research and Technology Labs.), and Dennis P. Townsend *In its* Advanced Power Transmission Technol. Jan. 1983 p 435-460 refs (For primary document see N83-20119 10-37)
(Grant NAG3-55)
Avail: NTIS HC A23/MF A01 CSCL 13I

A design procedure for sizing standard involute spur gearsets is presented. The procedure is applied to find the optimal design for two examples - an external gear mesh with a ratio of 5:1 and an internal gear mesh with a ratio of 5:1. In the procedure, the gear mesh is designed to minimize the center distance for a given gear ratio, pressure angle, pinion torque, and allowable tooth strengths. From the methodology presented, a design space may be formulated for either external gear contact or for internal contact. The design space includes kinematics considerations of involute interference, tip fouling, and contact ratio. Also included are design constraints based on bending fatigue in the pinion fillet and Hertzian contact pressure in the full load region and at the gear tip where scoring is possible. This design space is two dimensional, giving the gear mesh center distance as a function of diametral pitch and the number of pinion teeth. The constraint equations were identified for kinematic interference, fillet bending fatigue, pitting fatigue, and scoring pressure, which define the optimal design space for a given gear design. The locus of equal size optimum designs was identified as the straight line through the origin which has the least slope in the design region. S.L.

N83-20146*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STUDY OF LUBRICANT JET FLOW PHENOMENA IN SPUR GEARS: OUT OF MESH CONDITION
Dennis P. Townsend and L. S. Akin (Western Gear Corp.) *In its* Advanced Power Transmission Technol. Jan. 1983 p 461-476 refs Submitted for publication (For primary document see N83-20119 10-37)
Avail: NTIS HC A23/MF A01 CSCL 13I

The penetration depth onto the tooth flank of a jet of oil at different velocities pointed at the pitch line on the outgoing side of mesh was determined. The analysis determines the impingement depth for both the gear and the pinion. It includes the cases for speed increasers and decreasers as well as for one to one gear ratio. In some cases the jet will strike the loaded side of the teeth, and in others it will strike the unloaded side of the teeth. In nearly all cases the top land will be cooled regardless of the penetration depth, and postimpingement oil spray will usually provide adequate amounts of oil for lubrication but is marginal or inadequate for cooling. S.L.

N83-20147*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GEAR LUBRICATION AND COOLING EXPERIMENT AND ANALYSIS
Dennis P. Townsend and Lee S. Akin (Western Gear Corp.) *In its* Advanced Power Transmission Technol. Jan. 1983 p 477-490 refs Submitted for publication (For primary document see N83-20119 10-37)
Avail: NTIS HC A23/MF A01 CSCL 13I

A gear tooth temperature analysis was performed using a finite element method combined with a calculated heat input, a calculated oil jet impingement depth, and estimated heat transfer coefficients for the different parts of the gear tooth that are oil cooled and air cooled. Experimental measurements of gear tooth average surface temperature and gear tooth instantaneous surface temperature were made with a fast response, infrared, radiometric microscope. Increasing oil pressure has a significant effect on both average surface temperature and peak surface temperature at loads above 1895 N/cm(1083 lb/in) and speeds of 10,000 and 7500 rpm. Both increasing speed (from 5000 to 10,000 rpm) at constant speed cause a significant rise in the average surface temperature and in the instantaneous peak surface temperatures on the gear teeth. The oil jet pressure required to provide the best cooling for gears is the pressure required to obtain full gear tooth impingement. Calculated results for gear tooth temperatures were close to experimental results for various oil jet impingement depths for identical operating conditions. S.L.

N83-20148*# Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.
DYNAMIC TOOTH LOADS AND STRESSING FOR HIGH CONTACT RATIO SPUR GEARS
R. W. Cornell and W. W. Westervelt *In* NASA. Lewis Research Center Advanced Power Transmission Technol. Jan. 1983 p 491-502 refs Submitted for publication (For primary document see N83-20119 10-37)
(Contract NAS3-17859)
Avail: NTIS HC A23/MF A01 CSCL 13I

An analysis and computer program were developed for calculating the dynamic gear tooth loading and root stressing for high contact ratio gearing (HCRG) as well as LCRG. The analysis includes the effects of the variable tooth stiffness during the mesh, tooth profile modification, and gear errors. The calculation of the tooth root stressing caused by the dynamic gear tooth loads is based on a modified Heywood gear tooth stress analysis, which appears more universally applicable to both LCRG and HCRG. The computer program is presently being expanded to calculate the tooth contact stressing and PV values. Sample application of the gear program to equivalent LCRG (1.566 contact ratio) and HCRG (2.40 contact ratio) revealed the following: (1) the operating conditions and dynamic characteristics of the gear system an affect the gear tooth loading and root stressing, and therefore, life significantly; (2) the length of the profile modification affect the tooth loading and root stressing significantly, the amount depending on the applied load, speed, and contact ratio; and (3) the effect of variable tooth stiffness is small, shifting and increasing the response peaks slightly from those for constant tooth stiffness. S.L.

N83-20149*# International Harvester Co., Hinsdale, Ill.
A COMPUTER CODE FOR PERFORMANCE OF SPUR GEARS
K. L. Wang and H. S. Cheng (Northwestern Univ.) *In* NASA. Lewis Research Center Advanced Power Transmission Technol. Jan. 1983 p 503-518 refs (For primary document see N83-20119 10-37)
(Contract NGR-14-007-084)
Avail: NTIS HC A23/MF A01 CSCL 13I

In spur gears both performance and failure predictions are known to be strongly dependent on the variation of load, lubricant film thickness, and total flash or contact temperature of the contacting point as it moves along the contact path. The need of an accurate tool for predicting these variables has prompted the development of a computer code based on recent findings in EHL and on finite element methods. The analyses and some typical results which to illustrate effects of gear geometry, velocity, load, lubricant viscosity, and surface convective heat transfer coefficient on the performance of spur gears are analyzed. S.L.

N83-20150*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EVALUATION OF HIGH-CONTACT-RATIO SPUR GEARS WITH PROFILE MODIFICATION
Dennis P. Townsend, Berl B. Baber (Midwest Research Inst.), and Andrew Nagy (Midwest Research Inst.) *In its* Advanced Power Transmission Technol. Jan. 1983 p 519-531 refs (For primary document see N83-20119 10-37)
(Contract NAS3-20026)
Avail: NTIS HC A23/MF A01 CSCL 13I

Scoring tests, surface fatigue tests, and single-tooth bending fatigue tests were conducted with four sets of spur gears of standard design and three sets of spur gears of the new tooth form (NTF) design. Scoring tests were conducted in a gear test rig at a speed of 10,000 rpm using a synthetic polyester C5, C6, C7 substituted pentaerythritol oil. Surface fatigue tests were conducted in the same rig at a speed of 10,000 rpm and Hertz stresses of 173 x 10 to the 7th power and 143 x 10 to the 7th power Pa (250,000 and 214,000 psi). Single tooth bending fatigue tests were conducted on both the standard and NTF gears at an initial load that produced a 10.35 x 10 to the eight power Pa (150,000-psi) bending stress. The gears were load cycled to failure or for 3 x 10 to the 6th power cycles, whichever occurred first. The load was increased after test until failure occurred at 3 x 10 to the 6th power cycles or less. Both the standard and NTF gears scored at a gear bulk temperature of approximately 409 K (277 F). At this temperature the load on the NTF gears was 22 percent less than the load on the standard gears. The scoring failure was a function of gear bulk temperature, where for a given lubricant the temperature is a function of gear design, operating load, and speed. S.L.

N83-20151# Committee on Science and Technology (U. S. House).
DIESEL TECHNOLOGY
Washington GPO 1983 193 p refs Hearing before the Subcomm. on Invest. and Oversight of the Comm. on Sci. and Technol., 97th Congr., 2d Sess., 6 May 1982
(GPO-99-748) Avail: Subcommittee on Investigations and Oversight

The relationship between diesel emissions and health effects are examined. An accurate prediction of diesel utilization on the highways is needed in order to evaluate their impact and design policies concerning them. The issues involved are discussed. S.L.

N83-20152*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FLUID DRIVEN SUMP PUMP Patent Application

Gary D. Nolt, inventor (to NASA) Filed 28 Jan. 1983 13 p
(NASA-Case-ARC-11414-1; US-Patent-Appl-SN-461714) Avail: NTIS HC A02/MF A01 CSCL 13K

A sump pump was adapted for use in a sump with insufficient dimensions to accommodate an electric motor and a pump. When liquid rose to a predetermined level, a float tripped a switch that energized a solenoid controlled valve to a surface located air supply at, e.g., 120 psi. Air was provided through hose from the surface to a chamber in the pump that was filled or partially filled with water or other liquid, which entered through check valve. The air drove the water up an outlet to the surface. A timer closed the solenoid controlled air valve at predetermined intervals to allow refilling of the chamber by water or other liquid surrounding the chamber until the liquid dropped below the predetermined level and switch was opened by float. B.G.

N83-20153*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETICALLY ACTUATED COMPRESSOR Patent Application
Philip A. Struder and Jack Evans, inventors (to NASA) Filed 28 Jan. 1983 17 p
(NASA-Case-GSC-12799-1; US-Patent-Appl-SN-461724) Avail: NTIS HC A02/MF A01 CSCL 13I

A vibration free fluid compressor was adapted for Stirling cycle cryogenic refrigeration apparatus comprising a pair of identical opposing ferromagnetic pistons located in a housing and between a gas spring including a sealed volume of a working fluid such as gas under pressure. The gas compresses and expands in accordance with movement of the pistons to generate a compression wave which can be vented out to other apparatus, for example, a displacer unit in a Stirling cycle engine. The pistons are urged outwardly due to the pressure of the gas; however, a fixed electromagnetic coil assembly, located in the housing adjacent the pistons, is periodically energized to produce a magnetic field which interlinks the pistons in such a fashion that the pistons are mutually attracted to one another. NASA

N83-20154*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AUTOMATIC WELD TORCH GUIDANCE CONTROL SYSTEM Patent Application
Hubert E. Smith, William A. Wall, and Morrison R. Burns, Jr., inventors (to NASA) Filed 25 Jan. 1983 18 p
(NASA-Case-MFS-25807; US-Patent-Appl-SN-460733) Avail: NTIS HC A02/MF A01 CSCL 13I

A device for automatically controlling the movement of a welding torch while welding an elongated joint is described. A charge injection television camera is carried on a movable support and includes a matrix of individual light sensing video elements (pixels) which generate voltages responsive to light reflected off of the joint and surrounding areas of the workpiece. The voltages produced by the pixels are converted to digital words which are fed to a microprocessor for generating an error signal. This error signal is fed to a digital motor which is used to drive a movable support upon which the television camera is carried. NASA

N83-20155*# National Aeronautics and Space Administration. Pasadena Office, Calif.
HIGH PRODUCTION SHUTTLE CAR SYSTEM FOR COAL MINES Patent Application
Earl Collins, Jr., inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 14 Jan. 1983 13 p
(Contract NAS7-100)
(NASA-Case-NPO-15949-1; US-Patent-Appl-SN-457990) Avail: NTIS HC A02/MF A01 CSCL 13I

A system is described for loading newly mined material such as coal, into a shuttle car, at a location near the mine face where there is only a limited height available for a loading system. The system includes a storage bin having several telescoping bin sections, and a shuttle car having a bottom wall that can move under the bin. With the bin in an extended position and filled with coal, the bin sections can be telescoped to allow the coal to drop out of the bin sections and into the shuttle car, to quickly load the car. The bin sections can then be extended, so they can be slowly filled with more coal while awaiting another shuttle car. NASA

N83-20156*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LINE HOOK WITH LOOP EXPANDER Patent Application
Gary B. Bayless, inventor (to NASA) (Army Structures Lab., Hampton, Va.) Filed 25 Feb. 1983 12 p
(NASA-Case-LAR-12875-1; US-Patent-Appl-SN-469865) Avail: NTIS HC A02/MF A01 CSCL 13I

This invention describes a line hook with loop expander. The tool is comprised of a line hook, which is a piece of rod with a hook or other grasping device at one end and a handle at the other end, and on which is slidably mounted a loop expander. The loop expander has a tapered end which is pulled through a locking loop of a parachute pack, causing the locking loop to expand so that the parachute shroud lines may be easily pulled through by the grasping device in one simple operation. B.G.

N83-20157*# National Aeronautics and Space Administration. Pasadena Office, Calif.
ARTICULATED JOINT FOR DEPLOYABLE STRUCTURES Patent Application
Norwood D. Craighead (JPL, California Inst. of Tech., Pasadena), Richard J. Preliasco (JPL, California Inst. of Tech., Pasadena), and Timothy D. Hult, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) 25 Feb. 1983 12 p
(Contract NAS7-100)
(NASA-Case-NPO-16038-1; US-Patent-Appl-SN-469864) Avail: NTIS HC A02/MF A01 CSCL 13I

A joint is described for connecting a pair of beams to pivot them between positions in alignment or beside one another, which is of light weight and which operates in a controlled manner. The joint includes a pair of fittings and at least one center link having opposite ends pivotally connected to opposite fittings and having axes that pass through centerplanes of the fittings. A control link having opposite ends pivotally connected to the different fittings controls their relative orientations, and a toggle assembly holds the fittings in the deployed configuration wherein they are aligned. The fittings have stops that lie on one side of the centerplane opposite the toggle assembly. NASA

N83-20158# Embry-Riddle Aeronautical Univ., Daytona Beach, Fla.
OPTIMIZATION FOR VIBRATION ISOLATION Annual Report, 30 Jun. 1981 - 29 Jun. 1982
W. V. Nack Aug. 1982 50 p refs
(Grant AF-AFOSR-0226-81; AF Proj. 2307)
(AD-A122259; AFOSR-82-1019TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Algorithms have been developed which minimize the forced vibrational response of structural systems. The constraints which can be used are displacements or accelerations and natural frequencies. The design variables are linear changes to mass, stiffness or damping matrices. The constraints can be expressed in either the time or frequency domain and the cumulative constraint is used to measure the amount of constraint violation. It is shown that the variation of the displacement or acceleration constraints are shallow in reciprocal design variables. The objective function is a design variable which represents a value that keeps either displacements or acceleration less than a specified maximum value. A sequence of linear programs is formulated to take advantage of the almost linear character of the vibration isolation problem. The algorithms used in the displacement or acceleration constraints are general and consistent with algorithms that have been developed for weight minimizations, but have not been used for this purpose in the study. These algorithms have been studied for transient response, frequency response and stationary random. The results shown for the minimization of vibration response are very robust. Only passive vibration isolation has been studied and no attempt was made to consider ill conditioned problems. GRA

N83-20159*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LUBRICATION BACKGROUND
Bernard J. Hamrock and Duncan Dowson (Leeds Univ.) Sep. 1981 70 p refs Submitted for publication
(NASA-TM-81692; E-209; NAS 1.15:81692) Avail: NTIS HC A04/MF A01 CSCL 13I

Surface topography, including the various physical methods of measuring surfaces, and the various lubrication regimes (hydrodynamic, elastohydrodynamic, boundary, and mixed) are discussed. The historical development of elastohydrodynamic lubrication is outlined. The major accomplishments in four periods, the pre-1950's, the 1950's, the 1960's, and the 1970's are presented.
Author

N83-20160# Air Force Packaging Evaluation Agency, Wright-Patterson AFB, Ohio. Mechanical Engineering Dept.
INVESTIGATION OF MIL-B-131 BARRIER MATERIAL HEAT SEALS Final Report
Ted P. Smith and Dwight S. Sheeter Oct. 1982 16 p
(AFPEA Proj. 81-P7-27)
(AD-A121390; PTPT-82-10) Avail: NTIS HC A02/MF A01 CSCL 11/1

This study was performed to evaluate the severity of the 50 oz. dead weight test specified in MIL-P-116 for MIL-B-131 barrier material heat seals. Many of the Air Logistics Centers were reporting a high incidence of heat seal rejections. The study indicated the current test requirement and procedure to be realistic and attainable provided that proper techniques for equipment cleaning and set-up are followed. Also careful attention to temperature and pressure settings is necessary. Author (GRA)

N83-20161# Southwest Research Inst., San Antonio, Tex.
FUEL PROPERTY EFFECTS ON DIESEL ENGINE AND GAS TURBINE COMBUSTOR PERFORMANCE Interim Report, Oct. 1980 - Dec. 1981
A. F. Montemayor, D. W. Naegeli, L. G. Dodge, E. C. Owens, and J. N. Bowden Nov. 1981 82 p refs
(Contracts DAAK70-80-C-0001; DAAK70-82-C-0001; DA Proj. 1L7-62733-AH-20)
(AD-A120879; SWRI-6800-120/1; AFLRL-149) Avail: NTIS HC A05/MF A01 CSCL 21/2

In this test program, four military engines and a gas turbine combustor were run to determine the effects of fuel properties on combustion performance. During this program, 18 test fuels were prepared with properties extending beyond the range of the specifications of diesel fuels. Diesel engine performance data were analyzed statistically, and regression equations were obtained for each engine expressing load in terms of speed, energy input, cetane number, kinematic viscosity, 10 percent boiling point, and aromatic content. Combustion performance measurements in the T-63 gas turbine combustor included flame radiation, exhaust smoke, gaseous emissions (THC, CO and NOx), combustion efficiency, and ignition properties. The atomizing characteristics of the test fuels were examined with a particle sizing system based on forward-angle diffraction, and the results were correlated with the ignition properties of the fuels. Flame radiation and exhaust smoke were correlated with H/C ratio of the fuel. Viscosity and end point work were used as correlating parameters for THC and CO emissions, and combustion efficiency. Significance of the results was discussed, and recommendations for further testing was presented. GRA

N83-20162# Aerodyne Research, Inc., Billerica, Mass.
DEVELOPMENT OF AN AUTOMATED GEAR TOOTH CONTOUR MEASURING DEVICE Final Report
Alfred R. Quellette 12 Apr. 1982 112 p
(Contract DAAK50-81-C-0022)
(AD-A121970) Avail: NTIS HC A06/MF A01 CSCL 13/9

Phase 1 is a manually operated machine designed to demonstrate feasibility of measurement to an absolute accuracy of + or minus 10 to + or minus 30 microinches using a noncontacting optical probe. The Phase I testing demonstrated state-of-the-art performance as an environmentally compensated coordinate measuring machine wherein precision and absolute accuracy was shown to be better than the desired tolerance of + or minus 10 microinches. The noncontacting optic probe, also a state-of-the-art development, showed the sensitivity needed to meet the program goals. For the x-y coordinate measuring machine, errors associated with scale accuracy, vibration, structural rigidity, geometry and thermal effects were first defined analytically, and then correlated with the test data. Thermal stability tests were performed to show effects of machine warm-up from a cold start, effects of ambient temperature and atmospheric pressure changes, effects of human body heat, stabilized and transient operating conditions and the benefits of fluid filling the machine structure. Repeatibility tests were done for simple mechanical positioning precision and for part mensuration in the environmentally compensated mode. To evaluate absolute accuracy performance as an environmentally compensated system, gauge blocks were measured in an uncontrolled room at varying temperature around 12 F higher than the meteorological standard. GRA

N83-20163# Mindrum Precision Products, Rancho Cucamonga, Calif.
HIGH TEMPERATURE BEARING AND DRY: LUBRICATION CONCEPTS Final Report, Mar. - Sep. 1982
August O. Weilbach Sep. 1982 201 p refs Prepared in cooperation with Helvart Associates
(Contract N00014-82-C-0248; ARPA Order 4477)
(AD-A121386; MPP-82-1027) Avail: NTIS HC A10/MF A01 CSCL 11/2

The phase 1 program accomplished the study and functional evaluation of solid lubricant formulations in conjunction with the use of a specially designed and built test-bed bearing. The bearing was fabricated from hot pressed Silicon Nitride (HPSN). Special attention was given to problems associated with the design, material selection and lubrication of the ball-retainer. Much emphasis was also given to finding better methods of supplying lubricants to assure better bearing performance and to substantially extend the useful life of any type of solid lubricated bearing. Investigations were made into ways of finding better methods of bonding the solid lubricants to the ceramic substrate materials without the loss of low friction qualities. Adhesion testing was accomplished by coating coupons of candidate materials. Rub-show tests were conducted using the same family of substrate materials; also some commercial and all the proprietary solid lubricant formulations were submitted to a series of wear tests. GRA

N83-20164# ADAPT Service Corp., Reading, Mass.
BEARING LUBRICANT INTERFACE MONITORING USING COMPOSITE SIGNATURE ANALYSIS Final Report, 1 Jan. - 31 Jul. 1982
Herbert E. Hunter and David C. Hunter Sep. 1982 124 p refs
(Contract N00014-82-C-0145)
(AD-A122146; ADAPT-82-5) Avail: NTIS HC A06/MF A01 CSCL 13/9

This report presents the results of the feasibility phase or Phase I of a defense small business advance technology program (DESAT). The ultimate objective of the program is to improve and simplify engine failure prediction. This is to be accomplished by developing a series of objective algorithms which can use the results of standard engine monitoring measurements applicable to the bearing lubricant interface to detect, identify and estimate the remaining life of worn engine components. The Phase I objectives which were performed in the study which is reported here were to: (1) identify the data which is currently available, (2) establish the procedures required to obtain it and (3) to develop demonstration algorithms for a single aircraft engine type which would define the expected improvement in anticipated engine failures and illustrate the use of this approach. GRA

N83-20165# Borg-Warner Corp., Carson, Calif. Pump Div.
FEED-PUMP HYDRAULIC PERFORMANCE AND DESIGN IMPROVEMENT. PHASE 1: RESEARCH PROGRAM DESIGN, VOLUME 1 Final Report

W. H. Brown, S. Gopalakrishnan, R. Fehlau, W. E. Thompson, and D. G. Wilson Mar. 1983 149 p refs Sponsored by EPRI 2 Vol.
(EPRI Proj. 1884-6)
(DE82-903116; EPRI-CS-2323-Vol-1) Avail: NTIS HC A07/MF A01

The design, procurement, testing, and operation of large feed pumps with increased reliability and stability over the full range of operating conditions was investigated. A research plan based on a review of the present state of the art and which defined the necessary R & D program and estimated the benefits and costs of the program is presented. Thirty interrelated tasks were designed to perform the needed research; to verify the results; to develop improved components; and to publish computer-aided design methods, pump specification guidelines, and a troubleshooting manual. Most of the technology proposed in the research plan is applicable to nuclear power plants as well as to fossil-fired plants. Design, performance and failures of feed pumps, and recommendations for research on pump dynamics, design, and specifications are discussed. B.G.

N83-20166# Borg-Warner Corp., Carson, Calif. Pump Div.
FEED-PUMP HYDRAULIC PERFORMANCE AND DESIGN IMPROVEMENT. PHASE 1: RESEARCH PROGRAM DESIGN, VOLUME 2 Final Report
W. H. Brown, S. Gopalakrishnan, R. Fehlau, W. E. Thompsom, and D. G. Wilson Mar. 1982 196 p refs Sponsored by EPRI 2 Vol.
(EPRI Proj. 1884-6)
(DE82-903304; EPRI-CS-2323-Vol-2) Avail: NTIS HC A09/MF A01

An improved basis for the design, procurement, testing, and operation of large feed pumps with increased reliability and stability over the full range of operating conditions was implemented. A research plant based on a review of the present state of the art and which defined the necessary R & D program and estimates the benefits and costs of the program is discussed. It is designed to perform the needed research; to verify the results; to develop improved components; and to publish computer-aided design methods, pump specification guidelines, and a troubleshooting manual. Most of the technology proposed in the research plan is applicable to nuclear power plants as well as to fossil-fired plants. Appendixes on pump design, cavitation damage, performance testing, hydraulics, two phase flow in pumps, flow stability, and rotor dynamics are contained. B.G.

N83-20167# Lockheed Missiles and Space Co., Palo Alto, Calif.
DEVELOPMENT OF 400- TO 450-MHz RFQ RESONATOR-CAVITY MECHANICAL DESIGNS
Lash D. Hansborough Jan. 1982 27 p refs
(Contract W-7405-eng-36)
(DE82-010844; LA-9081-MS) Avail: NTIS HC A03/MF A01

Experience with the all copper 425 MHz RFQ proof of principle linac has demonstrated that the resonator cavity must be structurally stiff and easily tunable. This experience has led to development of copper plated steel structures having vanes that may be moved within a cylinder for tuning. Design of a flexible vane to cylinder radio frequency (rf) joint, the vane, and the cylinder has many constraints dictated by the small diameter cavities in the 400 MHz-frequency region. Two types of flexible, mechanical vane to cylinder rf joints are being developed: the C seal and the rf clamp joint. DOE

N83-20168# Mound Lab., Miamisburg, Ohio.
PROBLEMS ENCOUNTERED IN WELDING INCONEL 625 BRIDGE WIRE MATERIAL
T. G. Nelson 10 May 1982 23 p refs
(Contract DE-AC04-76DP-00053)
(DE82-014466; MLM-MU-82-65-0004) Avail: NTIS HC A02/MF A01

Welding problems occurred while resistance welding Inconel 625 to Inconel 600 pins in the MC3462A header at Unidynamics/Phoenix. The bridgewire showed transverse and longitudinal cracks, a condition called hot cracking, at the weld area. Welding studies at Mound confirmed a best effort could not produce welds without hot cracking. Two new bridgewire materials, Tophet C and Alloy 800, were then introduced to replace Inconel 625. Samples of both bridgewired headers welded at Unidynamics were studied at Mound to determine which was the better material. Results showed that alloy 800 was subject to the same hot cracking phenomenon as Inconel 625, whereas all samples of Tophet C except one showed no cracks. The only Tophet C sample showing cracks showed only minor cracks. Langley tests performed with Tophet C as the bridgewire showed that the no-fire characteristics can be met. Tophet C was therefore chosen to replace Inconel 625. DOE

N83-20169# California Univ., Livermore. Lawrence Livermore Lab.
PLANS AND RESOURCES REQUIRED FOR A COMPUTER NUMERICALLY CONTROLLED MACHINE TOOL TESTER
L. E. Newton, R. R. Burleson, H. K. McCue, C. L. Pomernacki, A. R. Mansfield, and J. J. Childs 19 Jul. 1982 21 p refs
(Contract W-7405-eng-48)
(DE83-003104; UCRL-53302) Avail: NTIS HC A02/MF A01

A computer numerically controlled (CNC) machine tools present unique and especially difficult problems in the areas of qualification and fault isolation. These problems, methods to resolve them effectively, and estimates of the resources needed to design and build a CNC/machine tool tester are examined. DOE

N83-20170# General Electric Co., Schenectady, N. Y.
ADVANCED-COOLING FULL-SCALE ENGINE-DEMONSTRATION PROGRAM Final Report
Sep. 1982 383p refs Sponsored by EPRI
(EPRI Proj. 1319-1)
(DE83-900607; EPRI-AP-2605) Avail: NTIS HC A17/MF A01

Advanced cooling techniques were applied to utility gas turbines to achieve greater fuel flexibility, reliability, durability, and efficiency. Water cooling for stage 1 turbine nozzles for near-term application was emphasized. The effectiveness of water as a cooling medium allows low metal temperatures to be achieved even at high gas turbine firing temperatures. The possible benefits that can be derived by these low metal temperatures were investigated. Twelve heavy fuel tests were conducted. Three of these tests were conducted with conventional air cooled stage 1 nozzles and nine tests were conducted with water cooled nozzles. The results of these tests showed that the low metal temperatures (approximately 8000 F) achieved with water cooling were effective in reducing the rate of fuel ash deposition by 50% from the rates with an air cooled nozzle with average surface temperatures of 15000 F. Further, the effect of surface temperature was found to be quite important with the water cooled nozzled. DOE

N83-20171# Oregon State Univ., Corvallis.
EFFECT OF LOW-PROOF ALCOHOL FUMIGATION-FUELING ON CRANKCASE OIL DILUTION IN A DIESEL-CYCLE ENGINE Final Report
John G. Mingle and Dwight J. Bushnell Nov. 1982 39 p ref
(Contract DE-AS19-81BC-10449)
(DE83-002976; DOE/BC-10449/1) Avail: NTIS HC A03/MF A01

A turbocharged diesel engine was converted to a dual fuel engine in which ethyl alcohol was fumigated between the turbocharger and the intake manifold, and the diesel fuel was injected normally at a reduced rate. The occurrence of crankcase oil dilution and its cause was examined by the following independent parameters: proof of the ethyl alcohol, crankcase oil temperature, engine load at maximum torque speed, and percentage of total energy in the form of ethyl alcohol. Engine tests were steady state for 6 hours, after which the crankcase oil was sampled for determination of flash points and fire points, water by centrifuge, water by distillation, and viscosity at room temperature. A decrease in thermal efficiency and an increase in exhaust carbon monoxide as the percentage of total energy as alcohol is increased is found. A decrease in flash points and fire points, and a decrease in

viscosity of the lubricating oils as the percentage of total energy as alcohol is increased is also shown. It is noted that there was no apparent structural damage to the engine during the testing. DOE

N83-20172# Creare, Inc., Hanover, N.H.
TWO-PHASE PERFORMANCE OF SCALE MODELS OF A PRIMARY COOLANT PUMP Final Report
P. S. Kamath, W. L. Swift, P. W. Runstader, Jr., and J. A. Block Sep. 1982 164 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 347-1)
(DE83-900265; EPRI-NP-2578) Avail: NTIS HC A08/MF A01

Scale models of PWR primary coolant pumps were tested in steady and transient two phase flows in order to generate a data base to aid in the development and assessment of pump performance models for use in computer codes for the analysis of postulated loss of coolant accidents. The single and two phase air/water and steam/water performance data on the relatively high specific speed pumps are summarized. These data are compared with those acquired from tests on the lower specific speed semiscale pump to better understand the mechanism of performance degradation with increasing void fraction. The study revealed that scaling down the size of the pump while maintaining the same design specific speed produces very similar performance characteristics both in single and two phase flows. Effects due to size and operating speed were not discernible within the range of test conditions and within experimental uncertainties. System pressure appears to affect the rate of degradation as a function of void fraction. A survey of the existing two phase pump performance correlations is included. DOE

N83-20173# National Center for Resource Recovery, Washington, D. C.
A PNEUMATIC CONVEYING TEST RIG FOR MUNICIPAL SOLID WASTE FRACTIONS
Marc L. Renard Sep. 1982 72 p refs
(Grant EPA-R-806709)
(PB83-107474; EPA-600/2-82-083) Avail: NTIS HC A04/MF A01 CSCL 13B

The material properties and system parameters relevant to the pneumatic conveying of municipal solid waste and its processed fractions are analyzed. Comparisons are made with the conveying of conventional industrial feedstocks, and a rationale for sizing and specification of a pneumatic conveying test rig is developed. The test assembly is to be used at solid rates ranging from a few to 20 to 30 Mg/h, on materials such as shredded municipal solid waste, refuse-derived fuel, canstock, etc., to study the dependency of the operating parameters and conditions on the conveying velocity, solid to air ratio, and product characteristics. Cost and sizing of the conveying test rig is established from this analysis and from manufacturers' quotes. Tradeoffs between outright purchase and testing for a fee are examined. GRA

N83-20174# Advanced Mechanical Technology, Inc., Newton, Mass.
MICRO-ISOTOPE TOOL WEAR SENSING Final Report
Bruce F. White and Walter D. Syniuta Feb. 1982 194 p refs
(Grant NSF MEA-78-22987)
(PB83-100826; NSF/MEA-7882006) Avail: NTIS HC A09/MF A01 CSCL 13I

The micro-isotope system was a tool wear sensing system which relies on the use of a miniscule deposit of radioactive material located on the wear zone of the cutting tool. Detection of the ionizing radiation from that deposit determined whether tool wear proceeded past the implant location. An improved arc welding technique for depositing the activity is reported. Several field tests were performed: one test was positive and reliably measured tool failure. The second results were poor because of low measurement times and low efficiency measurements of the radioactive missions. A comprehensive safety analysis prepared for the Nuclear Regulatory Commission demonstrated that use of this system in industrial environments presents no significant health hazards. GRA

N83-20175# Helsinki Univ. of Technology, Espoo (Finland). Dept. of Technical Physics.
MATHEMATICAL MODELS FOR AN AXIAL MAGNETIC FILTER
H. K. Collan, M. A. Kokkala, and O. E. Toikka Jan. 1982 16 p refs
(PB83-103549; TKK-F-A467; ISSN-951-752-484-6; ISSN-0355-779) Avail: NTIS HC A02/MF A01 CSCL 13I

A mathematical model to describe the macroscopic behavior of an axial magnetic filter is developed. The model takes into account the long range of absorption forces. Partial mixing of the particles in the fluid is taken care of by introducing the concept of a mixing length. The behavior of a filter at various conditions is numerically simulated. Preliminary experiments with colloidal ferrite particles indicate that for an axial filter, composed of 12 micrometer steel wires with a packing factor of 4.8%, the mixing length is of the order of 4 mm. GRA

N83-20176# Corporate-Tech Planning, Inc., Waltham, Mass.
THE ASSESSMENT OF ENGINE LOSSES DUE TO FRICTION AND LUBRICANT LIMITATIONS Final Report, May 1980 - Mar. 1981
C. Fayette Taylor, Theodore Taylor, Jr., and Robert L. Kallin Dec. 1981 72 p refs
(Contract DOT-HS-9-02110)
(PB83-105494; DOT-HS-806-17) Avail: NTIS HC A04/MF A01 CSCL 21G

A major area for improving the efficiency of spark ignition and diesel engines is a reduction of frictional losses. The means considered include reduction in oil viscosity, increase in bearing and piston clearances, possible changes in piston and valve gear design, and reduction of pumping losses. Estimates indicate potential fuel consumption improvements of 3 to 4% for Otto cycle at road load, 4 to 5% for diesel at wide open throttle, and 6% for diesel at road load. Much larger gains at road load could be obtained by using a stratified charge system which requires no air throttling. A literature search on techniques for measuring engine friction under firing conditions was also performed and various concepts employing pressure volume indicator diagrams were assessed. GRA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N83-20177*# Virginia Univ., Charlottesville. Dept. of Applied Mathematics and Computer Science.
THE IMPLEMENTATION AND USE OF ADA ON DISTRIBUTED SYSTEMS WITH RELIABILITY REQUIREMENTS Final Report
P. F. Reynolds, John C. Knight, and John I. A. Urquhart Mar. 1983 117 p refs
(Grant NAG1-260)
(NASA-CR-170014; NAS 1.26:170014; UVA/528213/AMCS83/102) Avail: NTIS HC A06/MF A01 CSCL 14D

The issues involved in the use of the programming language Ada on distributed systems are discussed. The effects of Ada programs on hardware failures such as loss of a processor are emphasized. It is shown that many Ada language elements are not well suited to this environment. Processor failure can easily lead to difficulties on those processors which remain. As an example, the calling task in a rendezvous may be suspended forever if the processor executing the serving task fails. A mechanism for detecting failure is proposed and changes to the Ada run time support system are suggested which avoid most of the difficulties. Ada program structures are defined which allow

programs to reconfigure and continue to provide service following processor failure. S.L.

N83-20178# European Space Agency, Paris (France).
RELIABILITY AND MAINTAINABILITY
T. D. Guyenne, ed. Sep. 1982 712 p refs Partly in ENGLISH and FRENCH Proc. of 3rd Inter. Colloq., Toulouse, 18-21 Oct. 1982; sponsored by ESA, CNES, CNET and SEE
(ESA-SP-179; ISSN-0379-6566) Avail: NTIS HC A99/MF A01

The contractual, human factor, and technical aspects of reliability engineering are examined. Topics covered include safety and fault tolerance; software; modeling and estimating; availability and maintainability; mechanics, electromechanics, and pyrotechnics; estimating and selecting components; standardization; and tests and diagnostics. For individual titles, see N83-20179 through N83-20275.

N83-20179# Societe Generale de Travaux Electriques, Puteaux (France). Dept. Fiabilite.
RELIABILITY CLAUSES IN LARGE EXPORT CONTRACTS: THEIR CONTENTS AND THEIR TRAPS [LES CLAUSES DE FIABILITE DANS LES GRANDS CONTRATS & L'EXPORTATION: LEURS CONTENUS ET LEURS PIEGES]
J. C. Ligeron and A. Delage *In* ESA Reliability and Maintainability Sep. 1982 p 3-10 In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The neglect of reliability clauses by industrialists can lead to cost overruns in very important projects. The principal reliability clauses found in large international contracts cover safety, maintainability, and availability (MTBF). Precautions to take and penalties to avoid for each of these aspects are underlined. References for consideration are listed which are based on specifications for equipment and transport. Transl. by A.R.H.

N83-20180# Groupement des Industries Francaises Aeronautiques et Spatiales, Paris (France). Groupe de Travail Fiabilite-Maintenance.
RECOMMENDATIONS AS TO THE ELABORATION OF OPERATIONAL RELIABILITY, MAINTENANCE COST AND AVAILABILITY CLAUSES IN AERONAUTICAL EQUIPMENT SUPPLY CONTRACTS [RECOMMANDATIONS POUR L'ELABORATION DE CLAUSES DE FIABILITE OPERATIONNELLE, DE COUT DE MAINTENANCE, DE DISPONIBILITE DANS LES CONTRATS DE FOURNITURE D'EQUIPMENTS AERONAUTIQUES]
J. N. Basmaison *In* ESA Reliability and Maintainability Sep. 1982 p 11-13 In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The fundamental notions it is advisable to keep in mind during the negotiation of clauses covering reliability, availability, and even the cost of maintenance discussed include: (1) shared responsibilities of the equipment supplier, the aircraft manufacturer, and the user in an operational evaluation of a material; (2) necessary and sufficient knowledge of the operational environment; (3) precise definition of and aptitude for measuring characteristics whose operational control is the object of these clauses; and (4) clarity of the contract in all technical, commercial, and administrative aspects. Transl. by A.R.H.

N83-20181# Centre National d'Etudes Spatiales, Toulouse (France).
THE IN-ORBIT PROFIT SHARING SCHEME OF THE SPOT SATELLITE [LE SCHEMA D'INTERESSEMENT EN ORBITE DU SATELLITE SPOT]
P. Couillard *In* ESA Reliability and Maintainability Sep. 1982 p 15-18 In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

When space applications have a commercial character, it is easy to reckon that the cost of an orbiting satellite is a large factor in setting the cost of the service rendered. This is also true in telecommunication such as those for Earth observation. A guaranteed orbital lifetime is of prime importance. The constant concern of satellite users led to a progressive increase in the life orbital life of geostationary satellites from 3 years to 5 years and then to 7 years. Shortly the objective is a 10-year increase. An improved orbital life is translated by accured reliability and also by particular care taken in constructing the satellite. The search for methods to better incite makers of satellite equipment to hold reliability performance tests resulted in profit sharing in orbit which is demonstrated in the development of SPOT. Transl. by A.R.H.

N83-20182# Electricite de France, Clamart. Direction des Etudes et Recherches.
QUANTIFYING HUMAN ERROR: THE NEED FOR A NEW APPROACH [QUANTIFICATION DES ERREURS HUMAINES: NECESSITE D'UNE NOUVELLE APPROCHE]
A. Cahuzac, M. Llory, and G. Morlat *In* ESA Reliability and Maintainability Sep. 1982 p 21-29 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The different possible ways of demonstrating the importance of human factors in nuclear power plant safety are reviewed as well as the types of actions taken in those plants. The quantitative analysis of human errors cannot be dissociated from the qualitative methodology for approaching human errors and by using data from all orders of experiments conducted in this area. The insufficiencies of classic analysis methods, developed especially in the United States by A. Swain and his collaborators are considered. An alternative method for studying human reliability is proposed, based partly on operator performance observation, principally on a simulator, and on the notion of Poisson processeses to represent the diagnostic process of operators. Transl. by A.R.H.

N83-20183# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Protection.
THE STAR WANDERER: THE INDIVIDUAL AND RISK MANAGEMENT [LE VAGABOND DES ETOILES: L'INDIVIDU ET LA GESTION DU RISQUE]
F. Ghertman and J. P. Pages *In* ESA Reliability and Maintainability Sep. 1982 p 31-35 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The problem of how to account for the individual in considerations for improving the safety of large systems is addressed. Risk is often assessed by the safety manager as the triplet: (probability of the event, consequences, and evaluation of the consequences); for the individual, risk results in a confrontation between himself and the situation to which he must respond. Failure can be better understood by considering the fact that, at each instant, the individual reacts differently not only as a function of the problems which he has to resolve (where his capability is involved), but also as a function of the place he occupies in a network of relations (affective dimensions). Attempts are made to isolate some dimensions characterizing the individual which have their importance in the day-to-day safety management of large systems.
Transl. by A.R.H.

N83-20184# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Div. Avions.
IMPACT OF ERGONOMIC STUDIES ON THE DESIGN OF CIVIL AIRCRAFT COCKPITS [IMPACT DES ETUDES ERGONOMIQUES SUR LA CONCEPTION D'UN POSTE DE PILOTAGE D'AVION CIVIL] **c05**
J. P. Laborie *In* ESA Reliability and Maintainability Sep. 1982 p 37-42 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The role played by human factors engineering in the design of the pilot station for the A310 airbus is described as well as the work conducted for the design of cockpits in future generation aircraft. Classical anthropometrics used in the design of the work station and seat as well as in the arrangement of the display panel are reviewed. The use of static measurements of pilot tasks dynamic measurements of a subjective type, and physiological measurements are described. Technologies developed for the

man machine interface examined include warning lights, numerialization, and cathode tubes. Transl. by A.R.H.

N83-20185# Societe Nationale des Poudres et Explosifs, Saint-Medard-en-Jalles (France).
THE RELATIVE INFLUENCE OF HUMAN FACTORS ON THE RELIABILITY OF A BANK OF DRAWING PRESSES [L'INFLUENCE RELATIVE DES FACTEURS HUMAINS SUR LA FIABILITE D'UN PARC DE PRESSES A FILER]
Simonotti, Beaurepaire, Nicolet (Eurequip), and Hanriot (Eurequip) *In* ESA Reliability and Maintainability Sep. 1982 p 43-48 In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

A total model of the man-machine-information system is required to measure the reliability of machine tools. Complementary approaches must be taken to include the human factor and all the factors and combinations of factors involved are determined by statistical analysis. Transl. by A.R.H.

N83-20186# Societe Bertin et Cie, Plaisir (France).
TAKING HUMAN FACTORS INTO ACCOUNT IN SYSTEMS RELIABILITY [PRENDRE EN COMPTE LES FACTEURS HUMAINS DANS LA FIABILITE DES SYSTEMES]
P. Boutin *In* ESA Reliability and Maintainability Sep. 1982 p 49-52 In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Consideration of human factors in systems reliability studies cannot be of the same type that is applied to the components of a system. The characteristics of the human operator require that this reckoning be done through an analysis of the functioning of the human machine and its interactions with the work environment. The human operator and the informatic elements in large complex systems are compared, not to determine if they are reliable, but to identify and act on the actors which improve reliability. Transl. by A.R.H.

N83-20187# MATRA Service Aerodynamique, Clamart (France).
SAFETY METHODOLOGY APPLIED TO THE LILLE METRO [METHODOLOGIE SECURITE APPLIQUEE AU METRO DE LILLE] **c85**
C. Marcovici and B. Le-Trung (Inst. de Rech. des Transports) *In* ESA Reliability and Maintainability Sep. 1982 p 55-63 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Technological innovations used in the 12 km metro in Lille are described including the integral automation, special switching, and the doors on the landing platforms. How the safety of the project is organized is examined and it is shown how the rules of the art of railroad safety, the classically positive methods of safety used in ground transportation, and probabalistic safety were combined. An example of a choice showing a good compromise of safety, availability, and comfort is developed. Transl. by A.R.H.

N83-20188# Societe Nationale Industrielle Aerospatiale, Toulouse (France).
DEMONSTRATION OF AN ACCEPTABLE SAFETY LEVEL FOR DIGITAL EQUIPMENT ON BOARD CIVIL TRANSPORT AIRCRAFT [DEMONSTRATION D'UN NIVEAU ACCEPTABLE DE SECURITE DES EQUIPMENTS NUMERIQUES A BORD DES NOUVEAUX AVIONS DE TRANSPORT CIVILS] **c03**
P. Toulouse *In* EAS Reliability and Maintainability Sep. 1982 p 65-69 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The demonstration of an acceptable level of safety depends on a qualitative measurement which considers a total analysis of equipment breakdown, the quality level of the software, in proportion to its criticalness and, if necessary, architectural precautions which permit exemption from the consequences of not easily predicted occurrences of latent errors in the software or modes of equipment breakdown. This effort must be reflected in documentation and should be recognized as acceptable by all principals involved in certification. Transl. by A.R.H.

N83-20189# Electricite de France, Clamart. Div. des Etudes et Recherches.
A SYSTEMS SAFETY-RELIABILITY ANALYSIS METHOD: THE COMBINED FAILURES METHOD [UNE METHODE D'ANALYSE DE LA FIABILITE ET DE LA SECURITE DES SYSTEMES: LA METHODE DES COMBINAISONS DE PANNES]
A. Villemeur *In* ESA Reliability and Maintainability Sep. 1982 p 71-79 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The use of failure modes and effects analysis (FMEA) generally shows only simple failures and should be completed by studying the combinations of failures which result in undesirable events. The combined failures method (MCP), initially used to analyze the reliability and safety of the Concorde and Airbus aircraft, is described and is recommended for use following FMEA. The principles of MCP are reviewed and illustrated in the analysis of a very simple system. Theoretical fundamental principles are then developed and an algorithm is proposed for using MCP to analyze a group of complex systems. Transl. by A.R.H.

N83-20190# Institut de Mathematiques Appliquees de Grenoble (France). Lab. d'Informatique et de Mathematiques Appliquees.
MODELS FOR THE EVALUATION OF THE FUNCTIONAL RELIABILITY OF REDUNDANT SYSTEMS [MODELES D'EVALUATION DE LA SURETE DE FONCTIONNEMENT DE SYSTEMES REDONDANTS]
P. Caspi and E. Pilaud *In* ESA Reliability and Maintainability Sep. 1982 p 81-87 refs In FRENCH Sponsored by Soc. Francaise d'Equipments pour la Navigation Aerienne Regi Autonome des Transports parisiens and Soc. Nationale des Chemins de Fer Francais (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

An assessment of the safety of a duplex system with external decision should be guaranteed in some way. A compromise is sought among the number, the extent of structural and numerical hypotheses which support the model, and the worst case character of the results obtained. With the aid of a pecular quality of convexity, a worst case mode is proposed, resting on a numerical hypothesis about the value of the latency of median error on the group of failures. This method is generalized for higher order redundancies. Transl. by A.R.H.

N83-20191# Commissariat a l'Energie Atomique, Berlin-Beliet (France).
INTRINSIC SAFETY OF A COMPLEX SYSTEM [SECURITE INTRINSEQUE D'UN SYSTEME COMPLEX]
R. Malaussena and A. Debiar *In* ESA Reliability and Maintainability Sep. 1982 p 89-94 In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Quantitization, a mathematical language, and a method for evaluating systems safety, is reponsible for the great progress made in the safety of weapons systems. This technique analyzes failure modes and shows, for former system, the increased number of parameters involved in safety itself. The methods used are demonstrated in a summary of the case of the intrinsic safety of an electric control and the general ideas which interest in quantitization. Transl. by A.R.H.

N83-20192# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'automatique et d'Analyse des Systemes.
SOFTWARE REDUNDANCY FOR ERROR DETECTION IN DISTRIBUTED SYSTEMS
J. M. Ayache, A. Sbai, B. Loyer (CIT=ALCATEL Cie. Ind. des Telecommun., Lannion, France), and J. L. Paul (CIT-ALCATEL Cie Ind. des Telecommun., Lanion, France) *In* ESA Reliability and Maintainability Sep. 1982 p 95-102 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The development and implementation of secure operational processors (combinations of hardware and software), capable of

integration in distributed systems used in telecommunications is discussed. A method of detecting errors is described. The method is based on the use of Petri nets and the 'observer' concept to provide a functional detection process in a distributed system. To achieve this, an observer implements a Petri net which models the specifications of interactions between the application processor and the rest of the system, providing a means of supervising the communication protocols. Problems related to the installation of an observer are then discussed. An embodiment under development to check the feasibility of the techniques proposed is summarized. The application chosen to test the implementation is a subscriber connection unit of an electronic telephone exchange. M.G.

N83-20193# Institut National de Recherche d'Informatique et d'Automatique, Toulouse (France).
THE SARGOS COMPUTER SYSTEM REDUNDANT MULTIPROCESSOR ARCHITECTURE (ARMURE) [ARMURE: ARCHITECTURE MULTI-PROCESSEUR REDONDANTE DU SYSTEME INFORMATIQUE DE SARGOS] **c60**
Y. Deswarte, P. Cohen, A. Machonin, K. Qadiri, N. Gargir, , and J. Lerouge *In* ESA Reliability and Maintainability Sep. 1982 p 103-111 refs In FRENCH (For primary document see N83-20178 10-38)
(Contract ADI/SURF-80.073)
Avail: NTIS HC A99/MF A01

One of the elements of the SARSAT/COSPAS program, the SARGOS system was designed to demonstrate the superiority of space methods for localating distress beacons. Specifications are presented for the safe functioning and the general organization of the system of information stations for local coverage. The concept used in developing this system is described with emphasis on: (1) the design and construction of the operating system; (2) the construction of the input-output system; (3) the processing of anomalies; and (4) system validation. A.R.H.

N83-20194# Compagnie de Signaux et d'Etreprises Electrique, Paris (France).
THE PAC: A SELF-CHECKING CONTROL PROCESSOR **c60**
J. N. Benso, R. Fourre, P. Larger, and P. Legris *In* ESA Reliability and Maintainability Sep. 1982 p 113-116 (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

One processing unit of a fail safe computer named PAC is described. The PAC computer consists of two processing units whose results are compared at each clock cycle by a fail-safe checker. To make sure that no failure remains undetected, each processing unit contains an on-line test ensuring that each component receives all the possible configurations of its own inputs. For any application process the same hardware structure is used. An algorithm was constructed to generate PROM contents performing both test and application function. M.G.

N83-20195# Ste pour l'Etude et la Fabrication de Circuits Integres Speciaux, Grenoble (France).
PAD: A FAULT TOLERANCE SPECIFIC CIRCUIT [LE PAD: UN CIRCUIT SPECIFIQUE DE LA SPECIFIQUE DE LA TOLERANCE AUX FAULTES] **c33**
J. Chavade (CNRS, Toulouse) and Y. Crouzet *In* ESA Reliability and Maintainability Sep. 1982 p 117-125 refs In FRENCH (For primary document see N83-20178 10-38)
(Contract DRET-78/447)
Avail: NTIS HC A99/MF A01

A fault tolerance specific circuit, designed to reduce cost in the number of units of a safe operating structure, PAD is based on a general architecture with duplication of central units and a duplication or a coding of memory blocks and of inputs/outputs. The operations performed by PAD are described and presented in the form of peripheral, programmable circuit of 6800 microprocessor family. Circuit diagrams for PAD, the programming of the circuit and of the mode for executing instruction, and self-checking at the level of PAD are considered. Transl. by A.R.H.

N83-20196# Societe Crouzet, Valence (France). Div. Aerospatiale.
A FUNCTIONALLY RELIABLE AVIONICS SYSTEMS [SYSTEME AVIONIQUE SUR DE FONCTIONNEMENT] **c06**
A. Demoment, J. P. Stefanini, and N. Travaillard *In* ESA Reliability and Maintainability Sep. 1982 p 127-134 refs In FRENCH Sponsored in part by STTE (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The need to elaborate an anemometer system while considering high levels of operating safety (1 to 1 x 10 to the 7th power/hour of flight for reliability) resulted in the definition of a method for designing safe operating digital systems as well as methods for numerical processing. The principle used involved designing a nominal operating structure and them elaborating from it the fail safe structure. The construction of multimicroprocessor models permitted validation of the method. Transl. by A.R.H.

N83-20197# Societe Generale de Travaux Electriques, Puteaux (France). Dept. Fiabilite.
THE SAFETY STUDIES FOR THE CARACAS METRO [LES ETUDES DE SECURITE DU METRO DE CARACAS] **c85**
J. C. Ligeron and A. Delage *In* ESA Reliability and Maintainability Sep. 1982 p 135-142 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The safety clauses of the Caracas Metro led the designers and reliability engineers to depart from conventional approaches to transportation system safety and to use analytical techniques inspired by those developed in the aerospace and nuclear industries. How safety aspects are expressed in the contract clauses, and the methods used to address them are discussed. Transl. by A.R.H.

N83-20198# Health and Safety Executive, Sheffield (England). Research and Laboratory Services Div.
HARDWARE/SOFTWARE RELIABILITY CONSIDERATIONS IN THE DESIGN OF MICROPROCESSOR CONTROLLED INDUSTRIAL SAFETY SYSTEMS **c60**
J. H. Powell *In* ESA Reliability and Maintainability Sep. 1982 p 143-149 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The safety and reliability implications of the more widespread use of microprocessor based systems for industrial process control are considered. The relationship between systematic methods of hazard and reliability analysis of industrial processes, and the development phases of microprocessors based safety systems to control these processes is explored. A design study of a safety control system for a specific industrial operation concerned with transport systems in coal mines is used to illustrate the discussion. M.G.

N83-20199# Societe Creusot-Loire, Paris (France).
SAFETY AND GOAL ALLOCATION STUDY FOR THE POMA 2000 TRANSPORTATION SYSTEM, USING A COMBINED FAILURES METHOD [ETUDE DE SECURITE ET ALLOCATION D'OBJECTIFS DU SYSTEME DE TRANSPORT POMA 2000 PAR UTILISATION D'UNE METHOE DE COMBINAISON DE PANNES]
J. Michaud, J. M. Cloarec (Societe Generale de Travaux Electriques), A. Delage (Societe Generale de Travaux Electriques), and J. C. Ligeron (Societe Generale de Travaux Electriques) *In* ESA Reliability and Maintainability Sep. 1982 p 151-156 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The POMA 2000 is a transportation system originally constituted by a vehicle circulating on its own track and moved by a traction cable on which the vehicle is held by a decoupling clamp. An experimental commercial application of the system is in progress for the town of LAON. As with all new transportation systems, POMA 2000 must justify a level of safety at least equal to that of classic transportation systems. The Paris metro was used as a reference system. The originality of the approach used

rests in a measure inspired by the combination of failures method used principally in aeronautical construction. Elementary failures affecting the different system constituents are studied. The repeated and accumulated failures are defined by combining elementary failures from outside events. Accumulated failures are regrouped as total failures with a view towards the goals. Total failures are then analyzed with respect to the introduction of preventive measures. Transl. by A.R.H.

N83-20200# Oak Ridge Associated Universities, Tenn.
A COMPOUND DISTRIBUTION MODEL FOR SOFTWARE RELIABILITY ESTIMATION
Way Kuo *In* ESA Reliability and Maintainability Sep. 1982 p 159-163 refs Sponsored by ORNL (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

A software reliability model is presented which assumes a time dependent failure rate and that debugging can remove as well as add faults with a non-zero probability. Based on these assmptions, the expected number of faults and mean standard error of the estimated faults remaining in the system are derived. The model treats the capability of correcting errors as a random process under which most of the existing software reliability models become special cases of this proposed one. It, therefore, serves to unify much of the current theory. The model deals with the nonindependence of error correction and should be extremely valuable for a long-scale software period. M.G.

N83-20201# CIT-ALCATEL Compagnie Industrielle des Telecommunications, Velizy (France).
SYSTEM E12: RELIABILITY OF HARDWARE AND SOFTWARE SOPHISTICATION
R. Lavergne, P. Mahieu, and J.-P. Cremieux *In* ESA Reliability and Maintainability Sep. 1982 p 165-172 (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Reliability engineering stategies used in the development of the CIT-ALCATEL E12 system are discussed. The system was designed for use in telecommunication networks at transit exchanges. M.G.

N83-20202# RIZ-IETA, Zagreb (Yugoslavia).
A GRAPHICAL PRESENTATION OF BAYESIAN APPROACH TO PARAMETER ESTIMATION IN A CASE OF POISSON FAILURE MODEL AND GAMMA PRIOR
S. Sever *In* ESA Reliability and Maintainability Sep. 1982 p 175-179 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

A graphical method for describing a Bayes estimation procedure of the Poisson parameter in a case of conjugate prior pdf is presented. The diagrams can be used for determining Bayes point estimate and upper confidence limits as well as for approximation of prior information by conjugate prior pdf. Examples of implementation of the method are given. M.G.

N83-20203# MATRA Service Aerodynamique, Velizy-Villacoublay (France). Service Fiabilite.
AN EXTENSION OF THE RESISTANCE/STRESS METHOD APPLIED TO THE MODELING OF THE FAILURE LAWS FOR ELECTRONIC COMPONENTS [UNE EXTENSION DE L'APPROCHE RESISTANCE/CONTRAINTE APPLIQUEE A LA MODELISATION DES LOIS DE DEFAILLANCE DES COMPOSANTS ELECTRONIQUES]
J. Ringler *In* ESA Reliability and Maintainability Sep. 1982 p 181-192 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

A formalism related to the resistance/constraint (R/C) approach used in mechanics is applied in the domain of electronics reliability. According to a first concept, component failure is associated with passing beyond the tolerance of a functioning characteristic of the component. The corresponding formalism is related to that of a R/C approach when a constraint of distributional amplitude is considered for material possessing a resistance defined with regard to constraint. In a second concept, failure is seen as a brutal physical rupture deep in the component following an excursion of constaint exceeding in amplitude the resistance capacity of a physical characteristic internal to the component. The corresponding reliability mode is obtained by using the R/C method in which the constraint is applied repeatedly according to a deterministic or probablistic process. These modes form a coherent whole simultaneouly encompassing failures by deviation and catalectic failures. Transl. by A.R.H.

N83-20204# Citroen Industrie, Paris (France).
OPTIMIZATION OF THE NUMBER OF TRIALS AND THEIR CHRONOLOGICAL ORDER NEEDED TO REVEAL A DERIVATIVE DUE TO TIME [OPTIMISATION DU NOMBRE D'ESSAIS ET DE LEUR ORDRE CHRONOLOGIQUE POUR LA MISE EN EVIDENCE D'UNE DERIVE DUE AU TEMPS]
M. Vigier *In* ESA Reliability and Maintainability Sep. 1982 p 193-196 In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

If a time function deviation is suspected, either it can be exempted during the course of a test, or it can be made obvious and measured. In this second case, a solution consists in considering time as one of the explanatory variables of the result. The time then is entered in the model used during the experiment. For example: Y(i) = a+b(1)X(1i) +b(2)X(2i)+B(1 2) X(i) X(2i)+b(3) X(3) +b(3 3) X(3) sup 2 with X(3) = t. In the strategy of the plan of the test, the chronological order is going to intervene so X (3) = t = (-0,1,2,3,4) or even X(3) = t = (-2,-1,0,1,2). It is necessary to try to make the matrix product (X'X) orthogonal by including X(3) which is part of the classic strategy of the test.
Transl. by A.R.H.

N83-20205# European Space Agency, Paris (France).
MULTICRITERIA OPTIMAL ALLOCATION OF SPARES FOR ELECTRONIC DEVICES
D. Ostojic (Mathematical Inst., Belgrade), S. Opricovic, R. Krtolica, A. Afric (Split Univ.), and Z. Vukovic (Zagreb Univ.) *In its* Reliability and Maintainability Sep. 1982 p 197-204 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

A multicriteria approach to the spare parts allocation problem is developed by use of the method of compromise programming in order to take into account the following criteria: availability, unit cost, reliability mean down time, and logistic effectiveness. M.G.

N83-20206# Societe Nationale Industrielle Aerospatiale, Cannes (France).
SATELLITE SYSTEMS REPLACEMENT AND AVAILABILITY PROCESS [PROCESSUS DE RENOUVELLEMENT DES SYSTEMES DE SATELLITES ET DISPONIBILITE]
J. L. Cazenave *In* ESA Reliability and Maintainability Sep. 1982 p 205-213 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The meaning of the currently used terms renewal and availability is clear only within the body of well defined mathematical models. There is renewal when units are added to an existing or evolving system. Reconfigurable systems and repairable systems are, on the contrary, constituted by an invariable ensemble of units. Satellite renewal is discussed based on advanced methods developed for systems with complex redundancy. An analogy with repairable systems is discussed. Solutions are proposed or established whose renewal is said to be conditional. Transl. by A.R.H.

N83-20207# Centre d'Actualisation Scientifique et Technique, Limoges (France). Centre d'Etude de la Fiabilite et de la Maintenance.
RELIABILITY AND MAINTAINABILITY IN THE COMPARATIVE ANALYSIS OF GENERAL PUBLIC PRODUCTS: TECHNIQUES AND ORGANIZATION [FIABILITE ET MAINTENANCE DANS L'ANALYSE COMPARATIVE DE PRODUITS 'GRAND PUBLIC':

TECHNIQUES ET ORGANISATION]
J. P. Ralko and R. Richard (Cooperative des Adherents de la Mutuelle des Instituteurs de France) *In* ESA Reliability and Maintainability Sep. 1982 p 215-221 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

A procedure is described for analyzing the different widely used consumer products distributed by CAMIF not only to assess their reliability with a view towards extending a warranty, but also to have a selection mode based on technical and economic aspects. The hoped for objective is to associate with each type of machine in a family, a coefficient representative of its quality which is one of the first arguments for choice. The methods used to define the representative coefficients of the products are developed. Transl. by A.R.H.

N83-20208# Centre National d'Etudes Spatiales, Toulouse (France).
DESCRIPTION OF THE SYSAT PROGRAM: APPLICATION TO THE STUDY OF THE RELIABILITY AND AVAILABILITY OF SPACE SYSTEMS [DESCRIPTION DU PROGRAMME SYSAT: APPLICATION A L'ETUDE DE LA FIABILITE ET DISPONIBILITE DES SYSTEMES SPATIAUX]
A.-M. Chemali, M. Gadoin, and M. Pircher *In* ESA Reliability and Maintainability Sep. 1982 p 223-228 In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The SYSAT program at CNES permits studies of the reliability and estimated availability of space systems by accounting for their peculiar characteristics to understand the requirements for reliability and high availability; and strategies for specific renewal, in which notions of finished stock, of the duration of deterministic life, and of launch scheduling are involved. Because the system is subjected to stochastic deterministic processes, its behavior is described by a Markov process coupled with judgments on the vector of the probability of states. The program developed avoids the recomposition of a complete Markov matrix for a minimal memory blockage; information of the evolution of the system is entirely contained in the decomposition of its subsystems. Transl. by A.R.H.

N83-20209# Conservatoire National des Arts et Metiers, Paris (France).
OPTIMIZATION IN THE DESIGN OF COMPUTER SYSTEMS ARCHITECTURE [OPTIMISATION DANS LA CONCEPTION D'ARCHITECTURES INFORMATIQUES] c60
V. Delebarre *In* ESA Reliability and Maintainability Sep. 1982 p 229-234 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The use of optimization modules in models for estimating the performance and safety of the operating systems of computers in order to regulate the configuration parameters is described. These models are based on the theory of stochastic processes. A method is proposed for solving optimization problems which are encountered in the design of computer systems. The class of problems to which this method can be applied is defined. Transl. by A.R.H.

N83-20210# Novatome, Le Pessis-Robinson (France).
INTRODUCTION TO SIGNAL PROCESSING IN RELIABILITY ANALYSIS [INTRODUCTION DU TRAITEMENT DU SIGNAL DANS LES ETUDES DE FIABILITE]
J. Debray *In* ESA Reliability and Maintainability Sep. 1982 p 235-240 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Certain redundant systems which haven't been studied under the signal processing aspect can, under the effect of various random functions (specific noise of the apparatus, induced parasites, and residue from filtering) be shown to be less reliable than if there were no redundancies at all. This problem is developed and generalized for analog and logic systems. Transl. by A.R.H.

N83-20211# Regie Autonome des Transports Parisiens, Paris (France).
RELIABILITY OF ELECTRONIC ONBOARD CONTROL SYSTEMS IN THE PARIS METRO [FIABILITE DES EQUIPMENTS ELECTRONIQUES EMBARQUES DU PILOTAGE AUTOMATIQUE DU METRO DE PARIS] c85
P. Cailliez and J. P. Richard *In* ESA Reliability and Maintainability Sep. 1982 p 241-247 refs In FRENCH; ENGLISH summary (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

For train-borne electronics, in a very disturbed environment (vibrations, heat, interference), the Poisson model may be insufficient to describe the rate of occurence of failures. Besides, these equipments which are conceived to be homogeneous, with regard to the maintenance, may be proved to be heterogeneous, in practice. To improve their global MTBF, emphasis should be given to the following points: (1) repeating failures too numerous according to the Poisson process; the improvement of failure localization would allow to reduce them; (2) some electronic cards accountable for most failures; (3) some cards which get old too quickly, mainly because of the accelerated deterioration of connections; and (4) environment: few very destructive trains.
Author

N83-20212# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Dept. Electronique.
RESULTS OF A QUALITY PRINCIPLE ON THE MTBF OF AN EQUIPMENT DEVELOPED FOR THE A-300 [RESULTATS D'UNE ACTION QUALITE SUR LE MTBF D'UN EQUIPEMENT DEVELOPPE POUR L'A-300]
N. Voisin *In* ESA Reliability and Maintainability Sep. 1982 p 249-254 In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The structure of quality control at the level of the equipment supplier is presented and applied in studies of the MTBF of the master warning controller of the A-300 aircraft. A plan is included for following the quality and reliability of onboard digital equipment and software configuration management. Transl. by A.R.H.

N83-20213# Centre National d'Etudes des Telecommunications, Lannion (France).
OPERATIONAL FOLLOW-UP OF TELECOMMUNICATION EQUIPMENT BY SAMPLING, USING THE SADE SYSTEM [SUIVI EN EXPLOITATION PAR ECHANTILLONAGE DES MATERIELS DE TELECOMMUNICATIONS A L'AIDE DU SYSTEME SADE] c32
H. Cadin, G. Gouret, C. Heno, C. Pichonnet, and Y. Robert *In* ESA Reliability and Maintainability Sep. 1982 p 255-259 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Contrary to an exhaustive follow-up which requires recall to judge the quality of materials, sampling permits knowledge of the rate of being out of order and the nature of the faults affecting the materials. Sampling using the system for analyzing defects during operation is considered as a means of determining the quality and reliability of telecommunication materials to be installed in hundereds of thousands of prototypes, such as subscriber terminals. Forms used for recording and reporting repairs are discussed. Transl. by A.R.H.

N83-20214# CR2A, Nanterre (France).
INTRODUCTION TO THE LAW OF PROBABILITY OF THE COEFFICIENT OF VARIATION IN APPLICATIONS OF THE RESISTANCE-STRESS METHOD [INTRODUCTION DE LA LOI DE PROBABILITE DU COEFFICIENT DE VARIATION DANS LES APPLICATIONS DE LA METHODE RESISTANCE-CONTRAINTE]
A. Desroches and M. Neff (Operation Electron. Rech. Operationnelle, Paris) *In* ESA Reliability and Maintainability Sep. 1982 p 261-265 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Several aspects of the resistance-stress method are reviewed and the sensitivity of rupture with respect to the coefficient of

variance (gamma) is studied. A method is developed for constructing the law of probability and charts are presented which show the quantile (gamma sub 1 - alpha) values of the coefficient of variance having the probability (alpha) to exceed of being exceeded. Transl. by A.R.H.

N83-20215# Societe Europeenne de Propulsion, Vernon (France).
OPERATIONAL RELIABILITY PROGRAM OF THE ARIANE PROPULSION SYSTEM [PROGRAMME DE FIABILITE OPERATIONNELLE DES ENSEMBLES PROPULSIFS ARIANE]
R. Vogin *In* ESA Reliability and Maintainability Sep. 1982 p 267-272 In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Various aspects to be addressed during an operational analysis of reliability (phase 3) of the Ariane launch vehicle are considered. The areas of activity include: (1) collection of data for entry; (2) statistics of incidents with comparison to allocations and classifications with relation to AMEC; (3) indexes of the evolution of total reliability (state achieved by the Ariane program); (4) reliability data bank; (5) special studies of the laws of survivability and of causation; and (6) a list of criticaql points. Concrete examples show how, from analyzing the laws of survivability, diagnostics can be directed, modifications proposed, origins of failures determined, and the laws of survivability can be optimized. Components discussed include the neck of the Viking motor blast pipe, a pressure reduction valve, solenoid control valves, the HM7 cryogenic motor, and the L140 servomotor. Transl. by A.R.H.

N83-20216# European Federation of Chemical Engineering, Athens (Greece).
RELIABILITY ANALYSIS OF DECAY HEAT REMOVAL SYSTEM OF BREEDER REACTORS: AN OPPORTUNITY FOR IMPROVING AVAILABLE METHODOLOGICAL TOOLS
C. A. Clarotti, M. Puccini, and R. Righini *In* ESA Reliability and Maintainability Sep. 1982 p 273-277 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

It is noted that neither the fault tree technique nor Markov approach is alone a panacea in reliability analysis. Their integrated use is needed in reliability practive and can lead to a mutual improvement of the two techniques. Such improvements are described which were achieved during the reliability study on the residual heat removal system of breeder-reactors. M.G.

N83-20217# MATRA Service Aerodynamique, Velizy-Villacoublay (France). Service Fiabilite.
CALCULATION OF COMPLEX RELIABILITY BLOC DIAGRAMS USING THE SO-CALLED CONDITION MATRICES METHOD [CALCUL DE BLOCS DIAGRAMMES COMPLEXES DE FIABILITE PAR LA METHODE DITE DES MATRICES DE CONDITIONS]
D. Turinetti *In* ESA Reliability and Maintainability Sep. 1982 p 279-284 In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The conditions matrices method permits easy computation of reliability block diagrams involving numerous subordinates. The principle of the proposed method is that, being given an architecture of whatever degree of complexity, the architecture can always be described under a form called the matrix of conditions whose reduction and analysis are the object of a thoroughly developed investigation. The method avoids usage of the classical Bayes theorem whose implementation becomes very difficult and even impossible on complex type structures. Transl. by A.R.H.

N83-20218# Katholieke Universiteit te Leuven (Belgium).
INTERACTIVE RELIABILITY ANALYSIS BY USING SALP AND COMPUTER-AIDED FAULT-TREE SYNTHESIS (CAFTS)
A. Poucet, P. DeMeester, A. Amendola (Joint Research Centre of the EEC), and A. Caretta (Joint Research Centre of the EEC) *In* ESA Reliability and Maintainability Sep. 1982 p 285-289 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The SALP-CAFTS software package permits to interactively construct, modify and analyze fault trees and can be used together with libraries containing component reliability models and reliability data. Extensive use of interactive graphics and modern techniques such as selection menus and full screen data entry panels results in an excellent interface between the analyst and the computer. By this interactive approach, the analyst is relieved from routine work, so that his/her attention is better focused on critical points of the analysis. Moreover, one has the possibility to perform sensitivity studies and system design optimization in a very fast and effective way. M.G.

N83-20219# MATRA Service Aerodynamique, Clamart (France).
AVAILABILITY OF THE LILLE METRO: EVALUATION, DEMONSTRATION, AND FIRST OPERATIONAL RESULTS [DISPONIBILITE DU METRO DE LILLE: EVALUATION, DEMONSTRATION ET PREMIERS RESULTATS OPERATIONNELS] **c85**
C. Marcovici *In* ESA Reliability and Maintainability Sep. 1982 p 293-298 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Tasks performed relative to the availability (assurance of punctuality) of the fully automatic Lille metro are discussed with focus on: (1) relations between MATRA and its associates for demonstrating in advance the objectives defined by the client; (2) the definition and practical implementation of a sequential demonstration test suggested by the UTE/CCT norm 190A, but complicated by the simultaneous treatment of two random variables: the mean time between failure and the mean time to repair (mean time of interruption of traffic); and (3) the study of the operational reliability, as far as possible, before the beginning of effective service. Transl. by A.R.H.

N83-20220# Centre National d'Etudes des Telecommunications, Lannion (France).
MAINTAINABILITY: AN ECONOMIC BET [MAINTENABILITE: UN PARI ECONOMIQUE]
D. Gardan, G. Griseri, and L. Gueguen *In* ESA Reliability and Maintainability Sep. 1982 p 299-304 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Maintainability, which determines the aptitude for repairing material, implies that during the course of the life of a product, repeated decisions are made about important and irreversible investments. The economic stakes confronting the RESEAU Department of CNES for repairing materials for telecommunication transmission are illustrated. Critical periods for decisions which occur when defining the means of repair and the implementation of repair policy are defined. Different strategies for repair are given and a model is presented for assessing repair costs. It is shown that, when this model is applied to a second generation repeater-regenerator, and analysis of sensitivity of the imputs to the model can reduce incertitude in the decision to be made. The economic aspect is associated with maintainability and a pragmatic procedure is proposed for all applying maintainability while ensuring the rentability of investments. Transl. by A.R.H.

N83-20221# Selenia S.p.A., Rome (Italy).
MAINTAINABILITY AND AVAILABILITY IN MODERN ELECTRONIC SYSTEMS: DESIGN FEATURES AND EVALUATION TECHNIQUES **c33**
B. Figliuzzi and G. A. Sparagna *In* ESA Reliability and Maintainability Sep. 1982 p 305-312 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The approach of defining a system performance degradation set and of incorporating special maintainability features (like on-line repair and reconfiguration) in the system is introduced and shown, with a practical example, as viable to permit more effective and convenient utilization of the system and to withstand limitations in the capabilities of logistic support organization. Author

N83-20222# MATRA Service Aerodynamique, Velizy-Villacoublay (France). Service Fiabilite.

AMDEC PREDICTION STUDIES OF MISSION INTERRUPTIONS: AN APPLICATION OF EVENT BY EVENT SIMULATION [DES ETUDES PREVISIONNELLES AMDEC AUX INTERRUPTIONS DE MISSION: UNE APPLICATION DES SIMULATIONS PAR EVENEMENT]

M. Agostini and M. Ammeux *In* ESA Reliability and Maintainability Sep. 1982 p 313-318 In FRENCH (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

The principle of the method of simulation by occurrence is the generation of the data failure by inversion of the exponential law R = ex (- lambda t). The predicted date = (1/ lambda) 1n. The dates of failures are calculated for each failure mode of each equipment, and are tabulated and sorted chronologically. A decision policy treats these events in proportion to their appearance. Simulation by occurrence is applied to a telecommunication satellite and to a system for underwater oil production. It is shown that the complementing classic reliability analysis with simulation, predicative assessments are extended to aspects of mission interruption and availability. Transl. by A.R.H.

N83-20223# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse des Systemes.

INFLUENCE OF TEMPORARY FAULTS ON THE AVAILABILITY OF COMPUTER SYSTEMS [INFLUENCE DES FAUTES TEMPORAIRES SUR LA DISPONIBILITE DES SYSTEMES INFORMATIQUES] **c62**

J. C. Laprie and A. M. Legwinski *In* ESA Reliability and Maintainabilaity Sep. 1982 p 319-326 refs In FRENCH (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

A fault in either materiel or software is considered temporary if the error created is recoverable by means of temporary redundancy. Complementing classical redundancy techniques for protection by using temporary redundancy techniques for protection by using temporary redundancy permits: (1) tolerating a higher number of faults that is not fixed by the type of protection redundancy used; (2) augmenting the duration of the mean life of the resources; and (3) diminishing the frequency of maintenance actions in the case of repairable systems. Two varieties of temporary redundancy (recovery and continuing ahead) are examined, and the influence of the reception structure on the choice between those two forms of redundancy is analyzed. An example of evaluation is provided. How the bond existing between the effectiveness of a recovery structure and the physical parameter influencing the behavior of the system can be established is demonstrated. Transl. by A.R.H.

N83-20224# Standard Elektrik Lorenz A.G., Stuttgart (West Germany).

FAULT-TOLERANCE ALLOWING DEFERRED MAINTENANCE TECHNIQUES

J. Dutt and H. Malec (ITT-Programming, Stratford, Conn.) *In* ESA Reliability and Maintainability Sep. 1982 p 327-331 refs (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

Cost effective maintenance concepts can be developed for systems that incorporate deferred maintenance concepts, such as those used in the communications industry. Specific implementations of such design philosophies for advanced communications systems are discussed. The fault tolerant aspects of fully distributed communications switching systems allowing for several redundancy techniques such as memory error correcting, automatic control, modular software design, redundant user interfaces, etc., are analyzed. The modeling techniques for both hardware and software implemented fault tolerance are presented. M.G.

N83-20225# Rex, Thompson and Partners, Farnham (England).

MAINTENANCE PROCEDURES FOR MAXIMIZING THE AVAILABILITY OF STORED ITEMS USED BY THE UK ARMED FORCES

J. M. Sheppard and A. A. Wingrove (RAE, Farnborough, Engl.) *In* ESA Reliability and Maintainability Sep. 1982 p 333-338 refs Sponsored by UK Ministry of Defence Procurement Executive (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

The results of an analysis of the problem of maintaining stored items of equipment in the UK Armed Services at the optimum level of availability are discussed. The analysis was used as a basis for a guide line document for the Ministry of Defence, and the usefulness of this guide is discussed. Its purpose is to assist in formulating cost effective RAM requirements and equipment upkeep procedures having regard to practical factors such as the effectiveness of test equipment and the fact that testing itself causes failures. M.G.

N83-20226# Societe Anonyme d'Etudes et Realisations Nucleaires, Limeil-Brevannes (France).

CORRECTIVE MAINTENANCE MANAGEMENT AID PROGRAMS [PROGRAMES D'AIDE A LA GESTION DE LA MAINTENANCE CORRECTIVE]

J. P. Menage and J. J. Lauly (Philips, Paris) *In* ESA Reliability and Maintainability Sep. 1982 p 339-343 refs In FRENCH (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

Three tools for corrective maintenance are presented which are located in the life cycle of a product. The OMPA program, which characterizes a waiting list, requires knowledge of the laws which regulate arrival and service, hypotheses on costs, technicians, and the depot. It computes probabilities. The OPTIMAN program also characterizes a waiting list. It is an approximating tool but has vaster applications. The OPSTO program optimizes techniques and the economics of stock management. Three procedures for different uses are described: optimization with a level of fixed service; optimization of costs; and computing the consequences of an existing policy. Examples are included.

Transl. by A.R.H.

N83-20227# Societe Nationale Industrielle Aerospatiale, Toulouse (France).

APPLICATION OF AN ANALYTICAL METHOD TO THE ELABORATION OF A MAINTENANCE PROGRAM FOR A NEW AIRCRAFT [APPLICATION D'UNE METHODE ANALYTIQUE A L'ELABORATION DU PROGRAMME DE MAINTENANCE D'UN NOUVEL AERONEF] **c01**

R. Adam *In* ESA Reliability and Maintainability Sep. 1982 p 345-350 refs In FRENCH (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

General objectives of a program for aircraft maintenance are listed and the history of the evolution of elaboration methods is reviewed including empirical and analytical methods with successive revisions. The last of the revisions, MSG3 was disseminated in 1980 and was recently applied. This method for analyzing the complete aircraft (systems, structures, and zones) is presented. Its objectives are to analyze the definition of the aircraft to study failure modes which are capable of affecting constitutive elements, and to define appropriate maintenance tasks so as to forewarn about failure modes capable of affecting the level of operational security and intrinsic reliability. Transl. by A.R.H.

N83-20228# Regie Autonome des Transports Parisiens, Paris (France).

THE MAINTENANCE AID DEVICE (DAM) PROJECT [LE PROJET DAM (DISPOSITIF D'AIDE A LA MAINTENANCE)]

J. P. Richard *In* ESA Reliability and Maintainability Sep. 1982 p 351-354 In FRENCH (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

The up-keep of the electronic systems of the autopilot for the Paris metro led, after 6 years of classic maintenance, to the concept of a maintenance project based on an original philosophy, new structure, and intelligent tools. From these, an information system

was developed to take care of the differences occurring in maintenance service. Transl. by A.R.H.

N83-20229# Datelec, Paris (France).
SEARCH FOR A SERVICE LIFE EVALUATION METHOD IN COMPUTER ASSISTED MAINTENANCE SYSTEMS [RECHERCHE D'UNE METHODE D'EVALUATION DE LA DURABILITE UTILISABLE DANS LES SYSTEMES M. A. O. (MAINTENANCE ASSISTEE PAR ORDINATEUR)]
M. Testylier *In* ESA Reliability and Maintainability Sep. 1982 p 355-361 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The application to studies of durability of the probabilistic theories relative to constraint and resistance to constraint is considered. This approach, used to evaluate reliability in mechanics, appears transposable to evaluate the economic durability of repairable goods. The method studied is applied under AFNOR standards and CEI specifications which permit parameterization of the elements of durability. Such parameterization should facilitate information for managing computer-aided maintenance. Transl. by A.R.H.

N83-20230# Centre d'Analyse de Defense, Arcueil (France).
DETERMINATION OF INITIAL SPARE PARTS SUPPLY [DETERMINATION DES APPROVISIONNMENTS INITIAUX EN RECHANGES]
P. Levy and O. Natta *In* ESA Reliability and Maintainability Sep. 1982 p 363-367 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Various models are presented for determining the stocks of spare parts to be put in maintenance circuits. These supplies are optimized under budgetary constraints. Predicted improvements and extensions of the method are listed. Transl. by A.R.H.

N83-20231# Electricite de France, Clamart. Direction des Etudes et Recherches.
UNIFIED PROBABILISTIC APPROACH METHOD TO THE SAFETY OF MECHANICAL SYSTEMS: EXAMPLE OF AN APPLICATION IN THE NUCLEAR FIELD [METHODE UNIFIEE D'APPROACHE PROBABILISTE DE LA SECURITE DES SYSTEMES MECHANIQUES. EXEMPLE D'APPLICATION DANS LE DOMAINE NUCLEAIRE] . c73
J. F. Barbet, A. Delage (Soc. Generale des Travaux Electriques), and J. C. Ligeron (Soc. Generale des Travaux Electriques) *In* ESA Reliability and Maintainability Sep. 1982 p 371-381 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The determination of systems reliability and the application of the constraint-resistance approach used in mechanics to ascertain the resistance of materials, fatigue, mechanics, and rupture, form the basic for unified probabilistic approach for determining mechanical safety. Methods of qualitative analysis common to both of these approaches are presented. The respective limitations and interests of both types of quantitative analysis are examined, and the richness of a joint application of both methods is discussed. Transl. by A.R.H.

N83-20232# ANDERSA/GERBOIS, Palaiseau (France).
A FAILURE DIAGNOSIS METHODOLOGY [UNE METHODOLOGIE DE DIAGNOSTIC DE PANNES]
C. Baskiotis, J.-P. Brault, and A. Rault *In* ESA Reliability and Maintainability Sep. 1982 p 383-388 refs In FRENCH Sponsored by the Pilot Project SURF (For primary document see N83-20178 10-38)
(Contract STAE-77.93304)
Avail: NTIS HC A99/MF A01

A method for diagnosing the internal state of physical systems is presented, compared with other approaches, and applied to the MARBORE 2 aircraft. The equipment used to acquire the measurements is described. Transl. by A.R.H.

N83-20233# Kiev Polytechnic (USSR).
SOME ASPECTS OF THE INCREASE IN RELIABILITY AND MAINTAINABILITY OF THE COMPONENTS AND TOOLS USING LASER HARDENING TECHNOLOGY
V. Kovalenko *In* ESA Reliability and Maintainability Sep. 1982 p 389-394 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Different aspects of laser hardening with pulsed and continuous wave lasers are discussed with the accent made on the influence of laser beam characteristics and other machining conditions on hardness increase in the affected zones, on the change in alloying elements distribution in hardened region of the treated surface, etc. It is shown that by varying the laser power density and other parameters it is possible to change in wide range different working characteristics of the components and tools. Testing results of reliability for components and tools are presented as well. Author

N83-20234# Hitachi Ltd., Tokyo (Japan).
RELIABILITY AND PRODUCTIVITY OF ELECTROMECHANICAL PRODUCTS
Y. Suzuki, S. Miyakawa, S. Mitani, H. Kaiwa, and K. Nukada *In* ESA Reliability and Maintainability Sep. 1982 p 395-401 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

A total system which simultaneously achieves the high reliability and high productivity of electromechanical products and its practice on several products are described. The basic concept of this system is to enforce that every stage of development should be related to reliability and productivity improvement. At planning stage, a failure rate prediction method called COMAP leads to the reduction of the number of components. At production design stage, a method to evaluate the feasibility of parts to automatic assembling called AEM is applied. Finally, at mass production stage, automatic tests and effective aging should be considered. M.G.

N83-20235# Institut National des Sciences Appliquees, Lyon (France).
METHODOLOGICAL STUDY OF PREDICTED RELIABILITY APPLIED TO AN INTERSTAGE SKIRT [ETUDE METHODOLOGIQUE DE FIABILITE PREVISIONNELLE APPLIQUEE A UNE JUPE INTER-ETAGE]
J. Fauchon, G. Herbin, S. Martineau (ENSCI, Limoges, France), A. Lecrivain (CNES, Ivry, France), and B. Cherdo *In* ESA Reliability and Maintainability Sep. 1982 p 403-410 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Probabilistic techniques used to analyze the mechanical reliability of the second to third interstage skirt of the Ariane launch vehicle are described. The reliability of the method itself for studying the factors influencing optimization of the structural element in the complex case is demonstrated. Equal emphasis is put on the potential richness of information arising from supplemental departures from the principal program. The statistical distributions of different fields of applied and admissible stresses permits investigation of the criticality of inlet parameters (notably dimensional tolerance). The specific case treated shows that the procedure has, in general, advantages and disadvantages comparable with deterministic methods of calculation. A.R.H.

N83-20236# Bradford Univ. (England).
ALTERNATE RELIABILITY MODELS FOR MECHANICAL BAD CAPS LANGUAGE[ny]SYSTEMS
A. Z. Keller and A. R. R. Kamath *In* ESA Reliability and Maintainability Jul. 1982 p 411-415 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Alternative models are developed for mechanical components and systems which are directly related to the physical construction and behavior of the components rather than existing models at present catered for. Physical degradation such as wear, fatigue, and corrosion are directly catered for. These physical considerations lead to a class of pathological distributions as yet unencountered in the reliability literature inasmuch as they do not possess

means or higher moments. With these functions the concepts of mean time to failure and mean repair time become meaningless and other definitions are required. Mathematical properties and details of parameter estimation for the pathological distributions are also given. M.G.

N83-20237# Societe Nationale Industrielle Aerospatiale, Saint-Medard-en-Jalles (France).

ESTIMATING THE THRESHOLDS OF SAFETY AND PROPER OPERATION CHARACTERIZING THE SENSITIVITY OF ONE STROKE DEVICES WITH RESPECT TO A PARAMETER FOR THE BRUCETON METHOD APPLIED TO LAWS OF NORMAL AND LOGISTIC SENSITIVITY [ESTIMATION DES SEUILS DE SECURITE ET DE BON FONCTIONNEMENT CARACTERISANT LA SENSIBILITE DES DISPOSITIES MONOCOUPS VIS-A-VIS D'UN PARAMETRE PAR LA METHODE DE BRUCETON APPLIQUEE A DES LOIS DE SENSIBILITE NORMALE ET LOGISTIQUE]

C. Saubaude *In* ESA Reliability and Maintainability Sep. 1982 p 417-430 refs In FRENCH (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

The sensitivity of one stroke equipment, particularly pyrotechnic devices can be characterized by safety and proper operation thresholds associated at levels of chosen risk. These thresholds can be determined using the sequential Bruceton test by means of an hypothesis on the form of the law of sensitivity. The conduction of tests according to the Bruceton method is developed and a number of practical rules are demonstrated. The use of the tests leads to relations giving the characteristic parameters of the laws of sensitivity (punctual estimations and confidence intervals) and the values of the thresholds of safety and proper operation which procede from them. The values of thresholds obtained are compared by use of the same sequence of tests but without the hypothesis used held for the form of the laws of sensitivity (logistic or normal). A.R.H.

N83-20238# Centre National d'Etudes Spatiales, Toulouse (France).

THE ARIANE LAUNCH VEHICLE PYROTECHNIC SYSTEMS: A DESIGN METHODOLOGY BASED ON RELIABILITY AND SAFETY ANALYSIS [SYSTEMES PYROTECHNIQUES DU LANCEUR ARIANE: UNE METHODOLOGIE DE CONCEPTION BASEE SUR UNE ANALYSE DE LA FIABILITE ET DE LA SECURITE] c28

J.-P. Bouloumie *In* ESA Reliability and Maintainability Sep. 1982 p 431-436 refs In FRENCH (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

The Ariane launch vehicle is described as well as the different pyrotechnic functions associated with it. The method applied in designing and developing pyrotechnic systems is outlined. Critical techniques used for designing such systems for Ariane 1 are detailed and the evolution of these systems to standards for improving Ariane 2 and Ariane 3 are considered. The approach used in designing a pyrotechnic system for the separation and release of booster engines for the first stage of Ariane 3 based on an analysis of reliability and safety, is examined. A.R.H.

N83-20239# Societe Generale de Travaux Electriques, Puteaux (France). Dept. Fiabilite.

ADVANCED METHODS FOR THE CALCULATION OF THE RELIABILITY OF COMPLEX STRUCTURES [METHODES AVANCEES DE CALCUL DE LA FIABILITE DES STRUCTURES COMPLEXES]

J. C. Ligeron and A. Delage *In* ESA Reliability and Maintainability Sep. 1982 p 437-445 refs In FRENCH (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

A method proposed for assessing the reliability of complex systems is justified by reason of the fact that the systems studied were subjected to objective calculations of safety, reliability, and life duration. The application of the proposed approach is demonstrated in different examples: (1) the fatigue life of the vehicle bodies for the CARACAS metro; (2) the safety of a management deck in a factor at Hague; and (3) cracking of reservoirs under pressure. The problem of how to verify that the measurement of a mechanical system permits obtaining safety and reliability objectives is addressed. Various tools used to specific objectives when studying fracture mechanics are discussed. A.R.H.

N83-20240# Centre National d'Etudes des Telecommunications, Lannion (France).

FAILURE MECHANISMS IN HELICAL NEMATIC LIQUID CRYSTALS: PRELIMINARY INVESTIGATIONS [MECANISMES DE DEFAILLANCE DANS LES CELLULES A CRISTAUX LIQUIDS NEMATIQUES EN HELICE: ETUDES PRELIMAIRES] c76

G. Bouvy *In* ESA Reliability and Maintainability Sep. 1982 p 449-457 refs In FRENCH (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

Some notions on helical nematic liquid crystals and the operating principles of small cells are reviewed. Methods are described for determining the physical chemical parameters related to characteristic factors of the cell and to its behavior in the presence of materials. Some theoretical aspects regarding the nature of liquid crystals are considered. The chemical composition of crystal liquid mixtures, elementary purities, surface analysis, and the dosage of water are among the topics covered. A.R.H.

N83-20241# Centre National d'Etudes Spatiales, Toulouse (France).

CHARACTERIZATION OF PHOTOSENSITIVE CHARGE TRANSFER STRIPS BASED ON THEIR RESPONSE TO A TRANSITORY ILLUMINATION [CARACTERISATION DE BARRETTES PHOTOSENSIBLES A TRANSFERT DE CHARGES A PARTIR DE LEUR REPONSE A UN ECLAIREMENT TRANSITOIRE]

G. Rolland *In* ESA Reliability and Maintainability Sep. 1982 p 459-465 refs In FRENCH (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

The principal results of tests conducted on photosensitive charge transfer strips show three types of perturbations of the video signal inherent to the technological structure and to the internal architecture of these components. Beginning with an analysis of the response of the component to a luminous impulse, it is shown that there are: (1) a time of recovery after saturation of the device; (2) a persistent time constant for inferior illumination at the saturation level; and (3) an effect of parasite collection of information of the image by shift registers (closely bound to the diffusion of charges in the substrate and at the depth of photon flux penetration in the material). A.R.H.

N83-20242# Mitsubishi Electric Corp., Hyogo (Japan).

A COMPUTER AIDED TEST AND DIAGNOSTIC SYSTEM FOR THE RELIABILITY EVALUATION OF PLASTIC ENCAPSULATED 64 K DYNAMIC RAMS c88

K. Takakura, M. Iwatsuki, S. Hosomi, M. Fujimoto, K. Higuchi, H. Matsumura, H. Matsumoto, T. Nakano, T. Yoshihara, and S. Takano *In* ESA Reliability and Maintainability Sep. 1982 p 467-474 refs (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

A reliability evaluation in the development stage was carried out to evaluate the error rate and mode of soft and/or hard error for the plastic encapsulated Mitsubishi's 64 K bit NMOS dynamic RAMs (M5K4164P, NP) by using a computer aided test and diagnostic system. In order to evaluate these error rates systematically, the computer aided test and diagnostic system was developed, which consists of three test steps, device evaluation tests, watching operation life tests, and computer installed evaluation tests based on conception of the reliability evaluation for new products. M.G.

N83-20243# Centro Studi e Laboratori Telecomunicazioni, Turin (Italy).

EVALUATION OF THE RELIABILITY OF HIGH RADIANCE BURRUS DIODES [EVALUATION DE LA FIABILITE DES DIODES DE BURRUS A HAUTE RADIANCE] **c33**

A. Antolini, C. Gausco, and A. Piccirillo *In* ESA Reliability and Maintainability Sep. 1982 p 475-482 refs In FRENCH (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

Results are reported of life tests conducted under five conditions of constraint (temperature current) on Burrus diodes, emitters at 0.9 mm, belonging to two generations of devices. Analysis of failures identified two dominant modes of degradation: dark line effect defects, and dark spot defects. The percentage of bright devices increased among the second generation diodes, confirming improvement of technology. Numerical analysis led to the formulation of an hypothesis of a functional between average life and constraints; consequently, a MTBF of 2/8 time 10 to the 4th power h was extrapolated for the dark diodes and a MTBF of approximately 5.5 times 10 to the 6th power h was extrapolated for the bright devices. Life tests conducted on a small number of diodes isolated by implantation, shows that the technology, at present, is still not perfected. A.R.H.

N83-20244# British Telecom International (England).

AN APPRAISAL OF INTEGRATED CIRCUIT RELIABILITY PREDICTION MODELS **c33**

C. Johnston and F. H. Reynolds (British Telecom Research Labs., Ipswich, England) *In* ESA Reliability and Maintainability Sep. 1982 p 483-488 refs (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

The failure rate prediction models offered by the US MIL-HDBK-217 and the CNET Handbook of Reliability Data are critically reviewed. A composite stress weighting factor is proposed which comprises a weighted summation of Arrhenius terms corresponding to the main classes of failure mechanism and, for plastic encapsulation, acceleration factors for humidity. It is concluded that the CNET temperature weighting factor is the best simple expression available and a simple humidity weighting factor is proposed to augment the CNET model. Author

N83-20245# General Dynamics Corp., Pomona, Calif.

INCREASING RELIABILITY BY LOWERING SEMICONDUCTOR JUNCTION TEMPERATURE

J. C. Bear *In* ESA Reliability and Maintainability Sep. 1982 p 489-492 refs (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

The influence of semiconductor junction temperature on electronic system reliability is described. The procedure for calculating junction temperature during circuit design is presented, along with problems facing the designer. Guidelines for the management control of junction temperature are discussed, with particular emphasis on ways to simplify the designer's task so that temperature problems can be surfaced early and solved inexpensively, prior to design release for fabrication. Author

N83-20246# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Surete Nucleaire.

EFFECT OF NUCLEAR RADIATION ON THE RELIABILITY OF MICROPROCESSING AND ASSOCIATED CIRCUITS [EFFET DES RAYONNEMENTS NUCLEAIRES SUR LA FIABILITE DES MICROPROCESSEURS ET CIRCUITS ASSOCIES] **c60**

A. Laviron and J. Grisollet *In* ESA Reliability and Maintainability Sep. 1982 p 493-496 refs In FRENCH (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

The flexibility of the systems on which microprocessors are based permits the use of a kind of geographic division to simplify diverse interconnections. Such systems in nuclear installations can be subjected to irradiation generally at low intensity doses. Tests conducted on microprocessors and associated circuits in such environments introduce mixed neutron and gamma rays, and these rays separately. The tests were conducted on reprogrammable memories erasable by ultraviolet radiation, on microprocessors, on living memories, and on memories programmable by fusibles. The irradiation was carried out during operation. Results show that the microprocessor and most of the associated circuits can be affected by exposure comprising between 3,000 R and 25,000 R of gamma radiation. These exposures limit depending on the intensity of exposure. A.R.H.

N83-20247# Centre National d'Etudes Spatiales, Toulouse (France).

SIMULATION OF THE EFFECTS OF COSMIC RADIATION ON RAM'S IN CMOS TECHNOLOGY [SIMULATION DES EFFETS DU RAYONNEMENT COSMIQUE SUR LES MEMOIRES RAM EN TECHNOLOGIE C/MOS] **c76**

A. Baiget, A. Labarthe, R. Bimbot (Inst. de Physique Nucleaire, Orsay, France), and S. Bela-Negra *In* ESA Reliability and Maintainability Sep. 1982 p 497-504 refs In FRENCH (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

The relative intensities of the diverse components of cosmic radiation were determined with respect to their atomic mass and the relative abundance of iron group ions in the heavy components of these rays was ascertained. The variable energy cyclotron ALICE is capable of furnishing F56 ions with energy levels of 150 MeV or 300 MeV suitable for simulating the transitory phenomena generated by results of attempts to study the efects of cosmic rays on complex components, particularly on the random access memory are discussed. The choice of CMOS devices permitted is election of components with great immunity to latch up. A.R.H.

N83-20248# Laboratoire Central des Industries Electriques (France).

ANALYSIS OF PERCENTAGE OF DEFECTS IN INTEGRATED DIGITAL CIRCUITS DURING ELECTRICAL TESTS **c33**

J. C. Gourdon and C. Leclerq *In* ESA Reliability and Maintainability Sep. 1982 p 505-510 refs In FRENCH (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

Results are presented of statistical studies of 2,311, 559 integrated digital circuit tests conducted in 1981 at the request of French industrialists. The percentage of defects are analyzed as a function of numerous parameters (circuit family, electronic function, fabrication technology, model, manufacturer, and date of purchase). The value of burn in is evaluated. It is concluded that it is necessity to effect a control of 100% of integrated circuits before mounting them on cards. A.R.H.

N83-20249# MATRA Harris Semiconducteurs, Nantes (France).

IMPROVING THE RELIABILITY OF VLSI CIRCUITS BY CONSTRAINTS AND BY ELECTRIC TESTS [AMELIORATION DE LA FIABILITE DE CIRCUITS VLSI PAR CONTRAINTES ET TESTS ELECTRIQUES] **c33**

M. Potin and J. Robineau *In* ESA Reliability and Maintainability Sep. 1982 p 511-515 refs In FRENCH (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

Oxide short circuits, electromigration, contamination, and hot electron injection are among the types of defects found in semiconductors. These defects are dependent on the temperature, the voltage (electric field), the surface, and the geometry of the circuit. An attempt is made to show the advantage of voltage in making reliable a population of semiconductors in MOS technology by eliminating oxide defects. The electrical and thermal acceleration factors of oxides were verified and some voltage timer combinations were tested during a test of memories. Results are presented. A.R.H.

N83-20250# Bell Telephone Labs., Inc., North Andover, Mass.

ON OPTIMAL BURN IN MODELING AND ITS APPLICATION TO AN ELECTRONIC PRODUCT

Way Kuo *In* ESA Reliability and Maintainability Sep. 1982 p 517-524 refs (For primary document see N83-20178 10-38)

Avail: NTIS HC A99/MF A01

Burn in an important screening method used in predicting,

achieving, and enhancing field reliability. A cost optimization model is presented from the system viewpoint where burn in periods for the components are the decision variables. Total cost to be minimized is formulated as a function of the costs for the component, device burn in, shop repair, and field repair, which in turn are functions of the expected number of failures during and after burn in. Component reliability and system reliability are constraints to be satisfied. The proposed modeling technique is applied to an electronic product. The device failures are assumed to follow a Weibull failure law. The formulated problem with failure rates and cost factors is optimized. M.G.

N83-20251# Ste pour l'Etude et la Fabrication de Circuits Integres Speciaux, Grenoble (France).
STUDY OF BURN IN [ETUDE DU RODAGE]
J. P. Levy *In* ESA Reliability and Maintainability Sep. 1982 p 525-532 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Burn-in is the most commonly used selection operation for obtaining lots of integrated circuits that are free from the potential defects of newness. Its effectiveness is a function of its duration, of temperature, of the static or dynamic type and of the voltage for supplying components. A study of the influence of these parameters for NMOS technology silicon grids and for CMOS technology aluminum grids permitted measurement of the difference between the norms for selection and an optimal effectiveness, in an experimental framework. Transl. by A.R.H.

N83-20252# Radiotechniques S. A., Caen (France).
ANALYSIS OF FAILURE DURING THE MANUFACTURING OF INTEGRATED CIRCUITS [L'ANALYSE DE DEFAILLANCE EN COURS DE FABRICATION DE CIRCUITS INTEGRES] **c33**
C. Damm and N. Sirot *In* ESA Reliability and Maintainability Sep. 1982 p 533-536 In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

To maintain the electrical output of integrated circuits at a high and stable level, a special analysis of failure techniques is systematically applied to plates of integrated circuits that have abnormal output. Aspects discussed include: a synoptic table of operations for failure analysis; methodology; preliminary data; visual analysis of defects; demonstration of crystal defects; and electrical analysis. Some examples illustrate the advantages of the method which are the reduction of fabrication cost, and improvement of the quality and reliability of products in a comprehensive, controlled procedure. Transl. by A.R.H.

N83-20253# Societe Crouzet, Valence (France).
PIND TEST: SYNTHESIS OF WORK DONE AT CROUZET'S [PIND TEST: SYNTHESE DES TRAVAUX EFFECTUES CHEZ CROUZET]
T. Chesne and B. Lemarie *In* ESA Reliability and Maintainability Sep. 1982 p 537-544 In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Tests for detecting free particles in electronic component units are used as a means for component selection. The particle impact noise detection tests, now included in MIL-STD 883 B and MIL-STD 750 B, was introduced fifteen years ago as the PIND test. Work accomplished using this test on a sampling of 1930 components of different origin, representing six families of distinct units is described to demonstrate the efficiency of the method as well as its limitation. Transl. by A.R.H.

N83-20254# Indian Space Research Organization, Ahmedabad.
QUALIFICATION AND SCREENING OF ELECTROMECHANICAL SHUTTERS USED ONBOARD SATELLITES FOR EARTH OBSERVATIONS **c15**
S. R. Naik, V. K. Manglik, P. L. Kulkarni, B. G. V. Subramanyam, A. S. KiranKumar, and B. V. Aradhye *In* ESA Reliability and Maintainability Sep. 1982 p 545-552 (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

An account is given of the qualification and screening exercise carried out on electromechanical shutters of the television camera system flown on the Indian satellites for Earth observations. A special feature of the exercise was designing the methodology of qualification and screening of the shutters which were available only in commercial quality. The aim was to identify any weaknesses, devise appropriate modifications and screening of the property selected shutters from the available lot, after incorporation of verified modifications. The qualification and screening test programs are described and the results are analyzed. M.G.

N83-20255# Modena Univ. (Italy). Inst. di Fisica.
INVESTIGATION OF FAST SCHOTTKY CONTACT RELIABILITY USING PLASMA ETCHING **c33**
G. Ottaviani, C. Guasco (Centro Studi e Lab. Telecommunicazioni), and D. Riva (Centro Studie e Lab. Telecommunicazioni) *In* ESA Reliability and Maintainability Sep. 1982 p 553-556 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

A systematic investigation on a bipolar logic family was carried out as far as the reliability of the metallization system is concerned by means of thermal step stress. Computer aided equipment was used for the measurements. The samples were plasma-etched to allow observation of the metal-semiconductor interface. The results show good stability of the investigated elements. M.G.

N83-20256# Nippon Electric Co. Ltd., Kanagawa (Japan).
RELIABILITY DESIGN ANALYSIS ON ELECTRIC DOUBLE LAYER CAPACITOR: SUPERCAP **c33**
N. Watanabe *In* ESA Reliability and Maintainability Sep. 1982 p 557-563 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

An electric double layer capacitor, SUPERCAP, providing up to one million microfarad capacitance in less than one cubic inch was developed. Becausé of its ultra high capacitance and very low leakage current, the SUPERCAP can be used as the standby power source to power CMOS RAMs and microcomputers during undesirable primary power interruptions. The reliability design analysis on SUPERCAPs by means of failure mode and effects analysis is described together with the product structure, manufacturing process, and the reliability test results of the finished SUPERCAPs. M.G.

N83-20257# Silesian Technical Univ., Gliwice (Poland).
DETERMINING ELECTRONIC COMPONENTS RELIABILITY BY ACCELERATED LIFE TESTS **c33**
M. Budka and E. Czogala *In* ESA Reliability and Maintainability Sep. 1982 p 565-568 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Some details of the step-stress method are considered. In particular the procedure of determining the necessary number of components is presented as well as the approach to estimation of the duration of successive steps of the experiment. The considerations and their results are valid for electronic components if their failure-rate model is the Eyring's model or one of its modifications. M.G.

N83-20258# Ste pour l'Etude et la Fabrication de Circuits Integres Speciaux, Grenoble (France).
ADJUSTMENT OF HUMIDITY MEASUREMENTS IN ENCAPSULATIONS: APPLICATION TO THE PRODUCTION OPTIMIZATION AND CONTROL OF CERDIP PACKAGES [MISE AU POINT DE MESURES D'HUMIDITE DANS DES BOITIERS A CAVITE: APPLICATION A L'OPTIMISATION ET AU CONTROLE DE PRODUCTION DE BOITIERS DE TYPE CERDIP]
J. M. Legros, S. Piazzi, and P. Mortini *In* ESA Reliability and Maintainability Sep. 1982 p 569-576 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Three methods are presented for measuring the moisture content in units with cavities. Systems developed for implementing

these measurement methods are described. The three methods are then compared using proof units, and then applied to units assembled by a CERDIP type process. A.R.H.

N83-20259# Centre National d'Etudes des Telecommunications, Lannion (France).
CHOICE AND APPROVAL OF COMPONENTS USED IN TELECOMMUNICATION EQUIPMENT [CHOIX ET AGREMENT DES COMPOSANTS ENTRANT DANS LA CONSTITUTION DES EQUIPEMENTS DE TELECOMMUNICATIONS] c32
J. V. Leridant (DAII Issy-les-Moulineaux, France) and J. Y. LeTraon *In* ESA Reliability and Maintainability Sep. 1982 p 579-583 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

All components in telecommunications systems should be represented in a list of components approved by the General Direction of Telecommunications. The objectives of this approval are defined in the context of actual technical changes, the means used to achieve them, and the dynamics which this action should create. The general organization of the system, as well as the procedures, the controls, and the methods used are described. A.R.H.

N83-20260# Centre National d'Etudes Spatiales, Toulouse (France).
SELECTION AND DEVELOPMENT POLICY FOR COMPONENTS FOR SPACE USE [POLITIQUE DE CHOIX ET DE DEVELOPPEMENT DES COMPOSANTS POUR USAGE SPATIALE] c18
B. Cluzel *In* ESA Reliability and Maintainability Sep. 1982 p 585-587 In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The establishment of a genuine space policy, the availability of the powerful Ariane launch vehicle, and the progress of Earth observations and telecommunications applications satellites led to the redefinition of the policy for choosing electronic components. Satellites being developed are heavier and also more complex. There is considerable increase in the number of components, and a demand for more integrated functions. These problems are considered with particular emphasis on SPOT which is among those satellites most representative of actual trends. Equal importance is given to actions taken in France to evaluate components and to improve the depending situation of foreign suppliers for spacecraft electronic components. Transl. by A.R.H.

N83-20261# Centre National d'Etudes des Telecommunications, Lannion (France).
CHARACTERIZATION METHOD FOR LIQUID CRYSTAL DISPLAYS: RELIABILITY APPROACH [METHODES DE CARACTERISATION DES AFFICHEURS A CRISTAUX LIQUIDES: APPROCHE DE FIABILITE] c76
J. P. Boulet, J. Glasser, F. Chatton, G. Michaud, and H. Prigent *In* ESA Reliability and Maintainability Sep. 1982 p 589-595 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Liquid crystal displays, widely distributed in the public market in the form of watches and calculators, are now used in other applications where the requirements for quality and reliability are much more strict. Where there is a new family of components, there is need to implement new measurement techniques which permit comparisons among different products. Even if certain manufacturers of displays esteem results, the reliability of liquid crystal displays is poorly known because there is lack of standardization in this area. Whether dialog between the manufacturer and the user can be fruitful, it still remains true that economic conditions of the market play a preponderant role. Transl. by A.R.H.

N83-20262# Telefonaktiebolaget L. M. Ericsson, Stockholm (Sweden).
INTERNATIONAL STANDARDIZATION OF RELIABILITY AND MAINTAINABILITY TERMINOLOGY
K. Strandberg *In* ESA Reliability and Maintainability Sep. 1982 p 597-600 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The coordinated efforts to produce standardized vocabulary for reliability, maintainability, quality of service, and related areas are described. The work is expected to give a generally applicable core of terms and definitions. To this, additions and modifications could be made resulting in vocabularies useful for services and products for the various application fields. M.G.

N83-20263# Centre National d'Etudes Spatiales, Toulouse (France).
RECENT EVOLUTION AND FUTURE OUTLOOK OF SYSTEMS WITH IMPROVED COMPONENT QUALITY ASSURANCE ON AN INTERNATIONAL LEVEL [EVOLUTION RECENTE ET PERSPECTIVES D'AVENIR DES SYSTEMES D'ASSURANCE RENFORCEE DE LA QUALITE DES COMPOSANTS AU PLAN INTERNATIONAL]
H. Arciszewski *In* ESA Reliability and Maintainability Sep. 1982 p 601-608 In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The considerable constraints of reliability to which multiple equipments are subjected and the growing complexity of electronic components require a reinforced system for quality assurance. Technical, economic, and availability techniques were conducted at CNES at the beginning of the CONCERTO program in 1968. The transmission of those problems to the European level led the European Space Agency in 1971 to the creation of a coordinating group for space components (SCCG). In 1971, technical and economic considerations led to an agreement to insert space requirements of the SCC system into the Cenelec electronic components committee (CECC) system. Encouraging results of SCCG cooperation with CECC led in 1978, to the application of the reinforced assurance of quality of the CECC system to all domains of electronic component applications. Predicting a single system for quality control on the worldwide level by 1995 is justified. Transl. by A.R.H.

N83-20264# Institut de Mathematiques Appliquees de Grenoble (France).
DYNAMIC ANALYSIS TESTING OF VERY HIGHLY INTEGRATED CIRCUITS [LE TEST PAR ANALYSE DYNAMIQUE DES CIRCUITS A TRES HAUTE INTEGRATION] c33
G. Saucier and P. Basset *In* ESA Reliability and Maintainability Sep. 1982 p 611-618 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The designer responsible for the test and diagnostics of a circuit should prepare test documents based on specifications used in the design of the circuit. Test data to be sent should be prepared and the coordinates of points on the silicon to be observed should be indicated. These points are then observed by dynamic analysis techniques using the scanning electron microscope which should be automatically controlled by computer. The zones of the circuit to be accentuated are automatically determined. A very efficient test, without human intervention and one which avoids the addition of supplementary material, is then possible. Transl. by A.R.H.

N83-20265# Aix-Marseilles Univ. (France).
GENERAL METHOD FOR DEDUCTIVE SIMULATION OF BREAKDOWNS OTHER THAN CLASSIC STICKING [METHODE GENERALE POUR LA SIMULATION DEDUCTIVE DES PANNES AUTRES QUE LES COLLAGES CLASSIQUES]
M. Giambiasi, M. Sigal, and A. Miara (Montpellier Univ., France) *In* ESA Reliability and Maintainability Sep. 1982 p 619-624 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

A method is given for simulating faults other than the classic stick-to-zero and sticking-to-one. Nonclassic faults and their effects are discussed and it is shown that the introduction of an observability function at the logic level permits the deductive simulation of all faults that can be modeled at the logic level. A principal advantage of the proposed approach is that it does not modify the classical technique for evaluating and propagating the list of

faults. In addition, there is great flexibility in use since the simulator no longer specifies one class of given faults. Examples of breakdowns appearing in CMOS technology are used to illustrate the approach. Transl. by A.R.H.

N83-20266# Institut de Mathematiques Appliquees de Grenoble (France). Architecture des Ordinateurs.
ON-LINE AND OFF-LINE TEST: CLASSIFICATION AND RECENT RESULTS [TEST EN-LIGNE ET HORS-LIGNE: CLASSIFICATION ET RESULTATS RECENTS]
B. Courtois, P. Marchal, C. Postigo, J. P. Eynard (CNRS, Grenoble, France), and F. Geay (Electron. Marcel Dassault) *In* ESA Reliability and Maintainability Sep. 1982 p 625-632 refs In FRENCH; ENGLISH summary Sponsored by Centre National des Telecommunications and SURF (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Clear principles are defined for classifying different types of on-line and off-line tests, mainly for integrated CPUs. Some results are useful for boards and systems testing. The principles of the tests are described. The on-line discontinuous test is especially stressed due to the optimal order of procedures constituting a test program. This order is discussed as a function of external constraints. These methods facilitate an integrated point of view for differents tests of a CPU, e.g., for incoming inspection and in the field for a system. The state of progress for the applications to both M6800 and M68000 is clearly established. Further developments are discussed, including the design of a partially self-checking microprocessor according to the specified methodology. Author

N83-20267# Institut de Mathematiques Appliquees de Grenoble (France).
MICROPROCESSOR BEHAVIOR TEST AND AUTOMATIC GENERATION OF TESTS PROGRAMS [TEST COMPORTEMENTAL DE MICROPROCESSEURS ET GENERATION AUTOMATIQUE DES PROGRAMMES DE TEST] c60
C. Bellon, A. Liothin, S. Sadier, G. Saucier, R. Velazco (Electron. Marcel Dassault), and M. Issenmann *In* ESA Reliability and Maintainability Sep. 1982 p 633-638 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The problem of testing LSI circuits is related to their description which may be either structural or behavioral. In the case of a microprocessor, the behavioral description is based on information in the use manual which explains only the working of instructions, the ensemble of operators and elements for memorization; and the interface signals. A method for testing behavior must be defined for users which elaborates a test of the input of its components or a test for maintenance. The environment of such a test is discussed as well as its consequence for writing a program. One method for behavior testing is defined which permits the writing of a very modular program. The system for automatically generating behavior tests programs is also described. Transl. by A.R.H.

N83-20268# CEIS-Espace, Toulouse (France).
THE SARGOS SYSTEM PROCESSORS SELF TEST PROGRAM [PROGRAMME D'AUTO-TEST DES PROCESSEURS DU SYSTEME SARGOS]
J. Abadir and Y. Deswarte (Inst. National de Recherche d'Informatique et d'Automatique, Toulouse) *In* ESA Reliability and Maintainability Sep. 1982 p 639-648 refs In FRENCH Sponsored by Action Permenente d'Aide (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

A test program is elaborated for detecting the permanent failure of processors of the SARGOS ground station information system as well as those which occur during operation. These processors have INTEL 86/12 A cards. The methods chosen to test different components are discussed as well as practical problems encountered. Hypotheses for simplifying and the particular adaptations that had to be made when applying these methods are considered. Numerical results are given on the length of the test sequences and the test duration. A method is given for evaluation the factor of overburden by injection of faults. Preliminary comments on this evaluation are included. Transl. by A.R.H.

N83-20269# Etudes et Productions Schlumberger, Clamart (France).
AUTOMATIC GENERATION OF SYSTEM TEST SEQUENCES [GENERATION AUTOMATIQUE DES SEQUENCES DE TEST DE SYSTEMS]
G. Michel, C. Robach, and P. Malecha IN ESA Reliability and Maintainability Sep. 1982 p 649-656 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

A tool for computer aided testability analysis is described as well as its uses and its application in an industrial milieu. The method permits the evaluation, from the very beginning, of testability as a function of context. The testability of the equipment depends notably on the test material used and on the point of access to the system according to its use in industrialization, fabrication, or maintenance. Eventual design modifications, are allowed in order to obtain the best testability. An ordered lists of test sequences is automatically generated from which test procedures are written. This tool is based on a formal representation of the equipment by a model sufficiently elaborated to permit consideration of digital and analog circuits. This model constitutes the level of the method and will be used in a different way for tests to verify design, tests at the completion of fabrication, and on-site tests for fault diagnosis. Transl. by A.R.H.

N83-20270# Warsaw Technical Univ. (Poland).
DEDUCTIVE FAULT-SIMULATION TECHNIQUE FOR NONPROCEDURAL COMPUTER HARDWARE DESCRIPTION LANGUAGES c61
K. Sapiecha, E. Szczesny, and K. Walczak *In* ESA Reliability and Maintainability Sep. 1982 657-661 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

A method of deductive simulation of fault propagation effects through functional blocks which are described in a nonprocedural computer hardware description language (CHDL) is presented. The method consists in transformation of a CHDL circuit description into its corresponding binary decision diagram (BDD) and then in an application of the BDD to deductive fault simulation. M.G.

N83-20271# Bordeaux Univ. (France).
CHARACTERIZATION AND TESTING OF SYNCHRONIZER CIRCUITS c33
P. Marchegay, P. Nouel, E. Garnier, and G. Lacroix *In* ESA Reliability and Maintainability Sep. 1982 663-667 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The errors which occur in random access synchronous systems depend on the anomalous behavior of synchronizer devices owing to the marginal driving signals applied at the input of these. Experimental results are given concerning this phenomenon named metastable state and its origin is explained. The flip-flop synchronizers are characterized by introducing the uncertainty interval parameters. The principle of a measuring system founded on a statistical estimation is described. Some experimental results are given concerning various structure and technology flip-flops. M.G.

N83-20272# Centre d'Essais des Propulseurs, Orsay (France). Controle et Prevention.
INVESTIGATION OF SAFETY BY EVENT MODELING OF A GENERAL PUBLIC SYSTEM MANAGED BY PROGRAMMABLE AUTOMATION: SANISETTES 'J. C. DECAUX' [ETUDE DE SECURITE, PAR MODELISATION EVENEMENTIELLE D'UN SYSTEME GRAND PUBLIC GERE PAR AUTOMATE PROGRAMMABLE: LES SANISETTES 'J. C. DECAUX']
B. Gugger and M. Ladame *In* ESA Reliability and Maintainability Sep. 1982 p 669-675 In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The reliability analysis of the security of a system managed by a programmable control organ reveals failures whether they be of system sensors, of the common organ, or of the system operators. It is possible, however, when setting up the major hypotheses, to simplify the field of study which then can be modeled by using classic methods of system safety (fault trees, event trees). The events encountered in these representations principally account for the state of variable logic and can then be divided into two subevents - the state normally controlled by the program logic and the state due to a material defect. The study then permits proceeding to a validation of the program (with respect to recording) and to an evaluation/improvement of the system security (reduction of common modes and redundance). Transl. by A.R.H.

N83-20273# Selenia S.p.A., Naples (Italy).
DESIGN OF DIAGNOSTIC TOOLS FOR SYSTEMS AND UNITS: A CASE, STUDY
L. Ambrosanio, G. Rosato, and C. Sigillo *In* ESA Reliability and Maintainability Sep. 1982 p 677-684 (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The problem of SW diagnostic tools specifications, development, and validation for large computer based systems was studied at two different levels: units and systems. The methodological approach and the achieved results are presented. Field data are extensively used to validate the method. Concern is with field test of systems for the supervision and control of telephone exchanges. The following topics are dealt with: assessment of test philosophy of the system; fault analysis of the system components; specification of coverage figures; coverage analysis; software design; and testing; specifications and validations. M.G.

N83-20274# Societe d'Etudes et Conseils Aero, Paris (France).
HUMAN FACTORS ASPECT AS AN EXTENSION OF QUALITY ASPECTS [LE PLAN FACTEURS HUMAINS COMME EXTENSION DE PLAN DE QUALITE] c54
J. Marguin *In* ESA Reliability and Maintainability Sep. 1982 p 685-692 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

Man machine relations at the level of system design and development can be optimized using a human factors plan which is proportionally related to the quality plan. The necessity of considering human factors (operator performance, human reliability) in the design phases is discussed and the typical unfolding of a human factors plan is during program phases is described as well as its organization and the methods it implies. The methods of analysis applicable in this domain, the sources of data, and the mathematical models available are considered. Transl. by A.R.H.

N83-20275# Laboratoire d'Automatique et d'Analyse des Systemes, Toulouse (France).
SOFTWARE OPERATIONAL FUNCTIONAL RELIABILITY [SUR LA SURETE DE FONCTIONNEMENT OPERATIONNELLE DES LOGICIELS] c61
J. C. Laprie *In* ESA Reliability and Maintainability Sep. 1982 p 693-700 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

The evaluation of the reliability and availability of a software system is considered during the phase of its operational life as opposed its development and validation phases. The mechanisms for manifesting an error, the behavior of the software system up to the manifestation of the first error, and during its life cycle are studied. An approximate model is established which permits consideration, in a simple way, of errors due to design faults when assessing the safety of the system's operation. This model is used to evaluate the safe operation of an information system while taking into account both physical and design faults.
Transl. by A.R.H.

N83-20276# Naval Research Lab., Washington, D. C.
A SIMULATOR FOR RELIABILITY PREDICTIONS OF FAULT-TOLERANT SYSTEM ARCHITECTURES Interim Report
P. N. Marinos 30 Sep. 1982 29 p refs
(SF12131691)
(AD-A121694; AD-E000511; NRL-MR-4934) Avail: NTIS HC A03/MF A01 CSCL 14/4

This study is concerned with a simulation technique suitable for predicting the reliability of fault-tolerant system architectures. General fault-occurrence probability density functions are introduced, and techniques for generating postulated fault environments using these functions are presented. Methods for assigning faults to subsystems of a system exposed to a given fault environment are discussed and the utility of these methods for making reliability predictions is illustrated with a specific example derived from the radar field. The simulator which has been written in FORTRAN-77 is highly interactive and user oriented, and provides in addition to system reliability estimates, system MTBF and availability estimates under various repair strategies and degrees of fault coverage. GRA

N83-20277# General Electric Co., Sunnyvale, Calif.
AUTOMATION OF QUALITY MEASUREMENT Final Technical Report, Sep. 1979 - Sep. 1981
James A. McCall and David Markham Griffiss AFB, N.Y. RADC Sep. 1982 163 p refs
(Contract F30602-79-C-0267; AF Proj. 2528)
(AD-A121360; RADC-TR-82-247) Avail: NTIS HC A08/MF A01 CSCL 09/2

A prototype software system has been developed which allows manual input and provides for automated collection of software metric data, stores the data, and provides processing and reporting to facilitate use of the metric information to monitor and control the quality of a software product. The software system, call the Automated Measurement Tool, processes COBOL source code.
Author (GRA)

N83-20278# Adaptronics, Inc., McLean, Va.
ADVANCED SIGNAL PROCESSING OF TURBINE ROTOR BORE WAVEFORMS Final Report
M. F. Whalen, M. Zuralow, J. H. Barber, and A. N. Mucciardi Jan. 1982 108 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 502-8)
(DE82-902202; EPRI-NP-2203) Avail: NTIS HC A06/MF A01

Signal processing methods as applied to the ultrasonic inspection of turbine rotor bores were investigated. The RF waveform responses from near bore defects contain much information which can be used to characterize these flaws. Signal processing operations that can be used to enhance the quality and interpretation of rotor bore inspection data, and methods of characterizing the defects using the RF waveforms to provide the inspector with additional knowledge as to defect type were determined. An outcome of this effort was to develop an Adaptive Learning Network (ALN) model tested using data recorded on the (retired) Kanawha and Connors Creek rotors. Subsequent destructive results showed that the ALN was able to discriminate accurately between inclusions and crack-like flaws in the Kanawha rotor. DOE

N83-20279# Rockwell International Corp., Golden, Colo.
MASS SPECTROSCOPY: WATER ADSORPTION ON CHROMIUM COATINGS Annual Progress Report, Jan. - Dec. 1980
Tom L. McFeeters 1 Feb. 1982 34 p refs
(Contract DE-AC04-78DP-03533)
(DE82-010508; RFP-3089) Avail: NTIS HC A03/MF A01

Vacuum bake cycle and oxidation effects on water adsorption capacity of chromium coated production parts were investigated by dynamic mass spectrometry in the lower temperature (150 C) bakeout range. The results appear to indicate vacuum bakeout reduced adsorption capacity and oxidation increased it; however, the degree to which this occurs could be dependent upon the amount of oxidation initially present on the chromium surface.
DOE

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N83-20280* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
KINESIMETRIC METHOD AND APPARATUS Patent
William E. Thornton, inventor (to NASA) Issued 17 Oct. 1980 18 p Filed 17 Oct. 1980 Supersedes N81-15699 (19 - 06, p 0808)
(NASA-Case-MSC-18929-1; US-Patent-4,375,674; US-Patent-Appl-SN-198093; US-Patent-Class-364-559; US-Patent-Class-364-522; US-Patent-Class-364-413; US-Patent-Class-73-379; US-Patent-Class-128-782; US-Patent-Class-358-105) Avail: US Patent and Trademark Office CSCL 20K

Apparatus and method for the determination of functional capability of bodies are disclosed. Reach as well as velocity, acceleration and force generation at various positions may be determined for a body by a three dimensional kinesimeter equipped with an ergometer. A general data package indicative of performance potential of a subject body or collection of bodies is provided for interfacing with data characteristics of various environments.

Official Gazette of the U.S. Patent and Trademark Office

N83-20281*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A PRELIMINARY LOOK AT CONTROL AUGMENTED DYNAMIC RESPONSE OF STRUCTURES
Robert S. Ryan and Ronald E. Jewell Feb. 1983 31 p refs
(NASA-TM-82512; NAS 1.15:82512) Avail: NTIS HC A03/MF A01 CSCL 20K

The augmentation of structural characteristics, mass, damping, and stiffness through the use of control theory in lieu of structural redesign or augmentation was reported. The standard single-degree-of-freedom system was followed by a treatment of the same system using control augmentation. The system was extended to elastic structures using single and multisensor approaches and concludes with a brief discussion of potential application to large orbiting space structures. B.G.

N83-20282*# George Washington Univ., Washington, D.C. School of Engineering and Applied Science.
THE EFFECT OF LOW VELOCITY IMPACT IN THE STRENGTH CHARACTERISTICS OF COMPOSITE MATERIALS LAMINATES Progress Report
H. Liebowitz 22 Mar. 1983 29 p refs
(Grant NAG1-158)
(NASA-CR-170059; NAS 1.26:170059) Avail: NTIS HC A03/MF A01 CSCL 20K

The nonlinear vibration response of a double cantilevered beam subjected to pulse loading over a central sector is studied. The initial response is generated in detail to ascertain the energetics of the response. The total energy is used as a gauge of the stability and accuracy of the solution. It is shown that to obtain accurate and stable initial solutions an extremely high spatial and time resolution is required. This requirement was only evident through an examination of the energy of the system. It is proposed, therefore, to use the total energy of the system as a necessary stability and accuracy criterion for the nonlinear response of conservative systems. The results also demonstrate that even for moderate nonlinearities, the effects of membrane forces have a significant influence on the system. B.W.

N83-20283*# Northwestern Univ., Evanston, Ill.
MIXED TIME INTEGRATION METHODS FOR TRANSIENT THERMAL ANALYSIS OF STRUCTURES, APPENDIX 5
W. K. Liu [1982] 8 p refs
(Grant NAG1-210)
(NASA-CR-170061; NAS 1.26:170061) Avail: NTIS HC A02/MF A01 CSCL 20K

Mixed time integration methods for transient thermal analysis of structures are studied. An efficient solution procedure for predicting the thermal behavior of aerospace vehicle structures was developed. A 2D finite element computer program incorporating these methodologies is being implemented. The performance of these mixed time finite element algorithms can then be evaluated employing the proposed example problem. S.L.

N83-20284*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VARIABLE FORCE, EDDY-CURRENT OR MAGNETIC DAMPER Patent Application
Robert E. Cunningham, inventor (to NASA) Filed 3 Feb. 1983 11 p
(NASA-Case-LEW-13717-1; US-Patent-Appl-SN-463456) Avail: NTIS HC A02/MF A01 CSCL 20K

Variable damping for resonant vibrations which may occur at different rotational speeds in the range of rpms in which a rotating machine is operated is provided. A variable force damper includes a rotating mass carried on a shaft which is supported by a bearing in a resilient cage. The cage is attached to a support plate whose rim extends into an annular groove in a housing. Variable damping is effected by tabs of electrically conducting, nonmagnetic material which extend radially from the cage. The tabs at an index position lie between the pole faces of respective C shaped magnets. The magnets are attached by cantilever spring members to the housing. By rotating the support plate about the axis of the shaft, the tabs may be rotated through an angle 0 of about 40 deg away from the index or 0 deg position. At the 40 deg position minimum damping is obtained. NASA

N83-20285# Virginia Polytechnic Inst. and State Univ., Blacksburg. Coll. of Engineering.
ASSESSMENT OF LATERAL AND TORSIONAL STIFFNESS CHARACTERISTICS OF MEDIUM RISE CONCRETE BUILDINGS Final Report, Jun. 1981 - Sep. 1982
M. Mirtaheri and P. R. Sparks Sep. 1982 197 p refs
(Contract NSF CEE-81-05784)
(PB83-101238; VPI-E-82-24) Avail: NTIS HC A09/MF A01 CSCL 13M

Design assumptions for five concrete buildings, each representing a different structural system, were evaluated by comparing theoretical results with experimental data on dynamic characteristics. Initial estimates of the natural frequencies and mode shapes were made by using the TABS-77 program. Model improvements were made by incorporating the effects of 'nonstructral' partitions and cladding and by considering the efficiency of elevator cores. Improvements were made until theory and experimental results matched for both natural frequencies and mode shapes. Implications of incorrect modelling were investigated for both static and dynamic lateral loadings. This study showed that it is necessary to match both frequencies and mode shapes if an accurate model is desired. GRA

N83-20286# Northwestern Univ., Evanston, Ill. Dept. of Materials Science.
THRESHOLD AND PLASTIC WORK OF FATIGUE CRACK PROPAGATION IN HY80 AND HY130 STEELS Final Technical Report, 1 Sep. 1978 - 31 Aug. 1982
Morris E. Fine 1 Oct. 1982 65 p refs
(Contract N00014-78-C-0565; NR Proj. 122-208)
(AD-A121633) Avail: NTIS HC A04/MF A01 CSCL 11/6

The objective of the present research was to make a comprehensive study of the effect of heat treatment and microstructure on the fatigue crack propagation rate from the threshold stress intensity (delta K sub th) to the mid-range of stress intensity in HY80 and HY130. It was hoped that such a study would lead to an improvement in fatigue properties of HY80 and HY130 as well as a better understanding of how fatigue crack propagation is related to microstructure. While there is little theory for (delta K sub th), the mid-region of delta K is relatively well understood. In

previous research in this laboratory, the plastic work required to propagate a unit area of fatigue U was shown to be an important parameter for controlling the rate of fatigue crack propagation; da/dN is inversely proportional to crack U. A technique was developed for measuring U by cementing foil strain gages ahead of propagating fatigue cracks and mapping the local plastic work over the plastic zone at the crack tip. GRA

N83-20287# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
A NEW ENGINEERING THEORY OF PLANAR BENDING AND APPLICATIONS Interim Scientific Report
Pappu L. N. Murthy and Lawrence W. Rehfield Jan. 1982 153 p refs
(Grant AF-AFOSR-0056-81; AF Proj. 2307)
(AD-A121461; AFOSR-82-0960TR) Avail: NTIS HC A08/MF A01 CSCL 12/1

A new engineering bending theory is presented. Predictions of static bending response using this theory agree exactly with elasticity solutions for several uniformly distributed loading cases. The contributions due to various physical effects are found to be more pronounced for orthotropic materials with low shear and transverse extensional modli. Such properties are typical of advanced composite materials used in the aerospace industry. The theory is extended to study the dynamic behavior of beams and static buckling of columns. Validation for the theory is provided by analysis of classical benchmark problems - a simply supported beam under sinusoidally distributed loading and flexural wave propagation in rectangular slabs. Numerous applications are presented. Effects of property degradation due to hygrothermal conditioning on the behavior of several elementary unidirectional composite structures are studied. The hygrothermal condition used to simulate long term aircraft service does not pose a serious problem. The loss of performance is approximately ten percent. However, complete moisture saturation produces significant effects. Reductions in the performance up to 35 percent can be expected, thus indicating that this condition should be avoided. GRA

N83-20288# Technion - Israel Inst. of Tech., Haifa. Lab. of Materials Mechanics.
TIME DEPENDENT INELASTIC BEHAVIOR OF MATERIALS Final Scientific Report, 1 Jul. 1980 - 30 Sep. 1982
Sol R. Bodner Sep. 1982 16 p refs
(Grant AF-AFOSR-0214-80; AF Proj. 2307)
(AD-A121348; AFOSR-82-0961TR) Avail: NTIS HC A02/MF A01 CSCL 11/4

This report reviews the program of work performed under Grant AFOSR-80-0214, sponsored by the United States Air Force Office of Scientific Research through the European Office of Aerospace Research and Development (EOARD) during the period 1 July 1980 to 30 September 1982. The following topics were studied during this period: determination of the strain-rate dependent stress-strain behavior of metal matrix composites and laminates whose constituents are elastic-viscoplastic materials exhibiting both isotropic and anisotropic work-hardening; creep response of metals subjected to varying stresses and to a large range of stress; wave propagation in rods of elastic-viscoplastic workhardening materials; prediction of the formation of adiabatic shear bands in metals subjected to high rates of loading; and further development of an anisotropic work-hardening theory. Publications based on the research program are listed. Author (GRA)

N83-20289# Brown Univ., Providence, R. I. Div. of Engineering.
A STUDY OF LOCALIZED PLASTIC DEFORMATION AS RELATED TO FATIGUE MECHANISMS Final Technical Report
Jai-Man Baik, Laurenz Hermann, and Robert J. Asaro May 1982 142 p refs
(Grant AF-AFOSR-3246-77; AF Proj. 2306)
(AD-A121806; AFOSR-82-0990TR) Avail: NTIS HC A07/MF A01 CSCL 11/6

The micro and macromechanics of fatigue crack initiation and crack propagation in an age-hardenable 2048 aluminum alloy, which is the high purity version of 2024 or 2124 aluminum, and their relationship to localized plastic deformation were studied. Special attention was given to the importance of microstructure, including grain size and aging treatment in cyclic response and low cycle fatigue (LCF) behavior, crack growth along the phenomena of crack tip closure, and on overload retardation effects. Crack closure was studied in detail throughout the course of this research program and its use in describing crack growth was explored. Fracture toughness tests were performed and the results were compared with the KIC value reported in literature. Experimental techniques used in this research since they are novel and should have quite general applicability in fracture mechanics theory are discussed. The results show that the LCF performance and thus fatigue initiation life based on the plastic strain control tests do not show any appreciable differences between different temper materials, but crack closure levels, crack growth rates and overload retardation are well influenced by microstructure. The lowest crack growth related to highest crack tip closure loads and the largest amount of overload retardation are associated with underaged microstructures which are prone to display nonuniform deformation pattern characterized by localized shearing. GRA

N83-20290# California Univ., Berkeley. Dept. of Mechanical Engineering.
FINITE-ELEMENT FORMULATION FOR THE ANALYSIS OF PLASTIC DEFORMATION OF RATE-SENSITIVE MATERIALS IN METAL FORMING Final Report, 20 Sep. 1979 - 19 Sep. 1982
Shiro Kobayashi 29 Oct. 1982 88 p refs
(Contract DAAG29-79-C-0217)
(AD-A121791; ARO-15868.8-EG) Avail: NTIS HC A05/MF A01 CSCL 11/6

The finite-element formulation for the analysis of metalworking problems for rigid-viscoplastic materials, including the effect of temperature, has been established. Of particular significance is an accomplishment of the coupled analysis of deformation and heat transfer. The formulations were applied to the problems of solid cylinder compression and ring compression. Then, the forming processes of shell nosing at room temperature, as well as at elevated temperatures, were analyzed. The results demonstrate that it is now possible to analyze accurately not only cold forming processes, but also processes in warm and hot forming regimes, by the finite-element method, including the effects of strain, strain-rate, and temperature on material properties. Most recent achievement is an introduction of a new approach to the problem of preform design in shell nosing as a unique application of the finite-element method. The concept involved in the approach is to trace backward the loading path from a given final configuration. The method was applied to preform design in shell nosing.
Author (GRA)

N83-20291# Southwest Research Inst., San Antonio, Tex.
FATIGUE MICROCRACK BEHAVIOR UNDER THE INFLUENCE OF SURFACE RESIDUAL STRESSES Interim Report, 1 Sep. 1981 - 31 Aug. 1982
John E. Hack and Gerald R. Leverant 1 Nov. 1982 50 p refs
(Contract N00014-78-C-0674; NR Proj. 031-812)
(AD-A121775; SWRI-06-5382/4) Avail: NTIS HC A03/MF A01 CSCL 20/11

The boundary integral technique has been used to calculate complete crack opening profiles under conditions of zero and compressive surface residual stress states. The results show that in addition to reducing the overall opening of the crack during loading, a compressive surface residual stress can induce a lenticular crack profile through-the-thickness of the material. The boundary integral caiculations also provided excellent correlation with observed SCOD behavior. These results lend a great deal of credibility to the boundary integral stress intensity factor calculations. Direct observation of SCOD behavior and growth rate measurements on microcracks in HY-130 steel in both air and an aqueous solution of 3.5% NaCl indicate that residual stresses reduce SCOD much in the same way as in Ti alloys. In addition to this purely mechanical affect, the compressive residual stress induced lenticular crack profile apparently disrupts the crack tip chemistry in a brine environment and eliminates the crack growth

acceleration due to the so called small crack effect. A possible mechanism for this is discussed. The results of preliminary optical metallography of the microstructural development in three types of welding processes for one inch thick plate of Ti-6A1-2Nb-1Ta-0. 8Mo are also presented. Author (GRA)

N83-20292# Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering and Applied Mechanics.
STRENGTH OF MECHANICALLY FASTENED COMPOSITE JOINTS Final Report, Jun. 1981 - May 1982
Fu-Kuo Chang, Richard A. Scott, and George S. Springer Wright-Patterson AFB, Ohio AFWAL Jul. 1982 109 p refs
(Contract F33615-81-C-5050)
(AD-A121407; AFWAL-TR-82-4095) Avail: NTIS HC A06/MF A01 CSCL 13/5

A method is presented for predicting the failure strength and failure mode of mechanically fastened joints made of fiber reinforced composite laminates. The method includes two steps. First, the stress distribution in the laminate is calculated by the use of a finite element method. Second, the failure load and the failure mode are predicted by means of a proposed failure hypothesis together with Yamada's failure criterion. A computer code was developed which can be used to calculate the maximum load and the mode of failure of joints involving laminates with different ply orientations, different material properties, and different geometries. Results generated by the present method were compared to data and to existing analytical and numerical solutions. The results of the present method were found to agree well with the those reported previously. Parametric studies were also performed to evaluate the effects of joint geometry and ply orientation on the failure strength and on the failure mode. Author (GRA)

N83-20293# Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapons Systems Lab.
TWO SHOCK WAVE PHYSICS PROBLEMS: THE MACRO-MICRO COUPLING TERM AND SHOCK AMPLIFICATION IN PIEZOELECTRIC MEDIA
Paul Harris Nov. 1982 32 p refs
(DA Proj. 1L1-61101-A-91A)
(AD-A121670; AD-E400929; ARLCD-TR-82017) Avail: NTIS HC A03/MF A01 CSCL 20/11

Problem 1: The transfer of momentum from internal (microscopic) to center of mass (macroscopic) coordinates is considered for a system of nonuniform mass density and typical internal coordinates. First order averaging over the mass density is shown to lead to an internal variable contribution to the center of mass velocity proportional to time to the fourth power (in the t goes to 0 limit) and proportional to the square of the nonuniformity (i.e., the mass density disturbance amplitude). Problem 2: The gain is calculated for a boundary value problem with a strain function of the modulated exponential form in an active piezoelectric semiconductor. The boundary, via the electric field gradient, is seen to make a contribution to the gain and the allowed frequencies (for the linearized problem) in a way which does not appear in the acoustoelectric ultrasonic amplification problem. A formulism is set up which allows for the rapid calculation of gain even for the highly nonlinear problem. GRA

N83-20294# Ballistic Research Labs., Aberdeen Proving Ground, Md.
BLAST WAVE LOADING OF A 2-DIMENSIONAL CIRCULAR CYLINDER Final Report
George A. Coulter Nov. 1982 92 p refs
(DA Proj. 1L1-62618-AH-80)
(AD-A121600; ARBRL-MR-03207) Avail: NTIS HC A05/MF A01 CSCL 19/4

A two dimensional nonresponding cylinder was exposed to decaying shock waves induced in the BRL 57.5 cm shock tube. Pressure time records are shown for transducer locations spaced at 15 deg intervals around the cylinder for input sideon overpressure levels of 42.3, 75.9, and 112.2 kPa. Pertinent loading results are listed in tabular form. GRA

N83-20295# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
CYCLIC TORSION OF A CIRCULAR CYLINDER Final Report
P. C. T. Chen, M. R. Aboutorabi (Iowa Univ.), and H. C. Wu (Iowa Univ.) Oct. 1982 22 p refs Presented at the U.S. Army Symp. on Solid Mech., Cape Cod, Mass., 21-23 Sep. 1982
(DA Proj. 1L1-61102-AH-60)
(AD-A122198; AD-E440172; ARLCB-TR-82034) Avail: NTIS HC A02/MF A01 CSCL 20/11

The improved endrochronic theory of plasticity is applied to the case of a solid bar with circular cross-section subjected to cyclic fully-reversed torsional loading. Numerical techniques are employed to obtain the solution. The parameters of the constitutive equations are determined from the test data of thin-walled specimens. These parameters are then used without alteration of compute stress distributions within the solid specimen. The relation of torque vs. strain at the outermost fiber of the solid specimen provides an ultimate check of this theory. This report demonstrates an expanded use of improved theory. GRA

N83-20296# Pittsburgh Univ., School of Engineering.
THE STATE OF THE ART IN THE MECHANICS OF FRACTURE Final Report, 15 Aug. 1978 - 31 Mar. 1982
M. L. Williams and C. C. Yates May 1982 16 p
(Contract F49620-78-C-0101; AF Proj. 2307)
(AD-A122260; AFOSR-82-1020TR) Avail: NTIS HC A02/MF A01 CSCL 11/4

This report is a supplement to the annual technical report on the Science of Fracture project dated 30 November 1981 to the Air Force Office of Scientific Research and completes the work conducted on contract F49620-78-C-0101. The authors present their opinions as to the technical position of fracture mechanics within the framework of current military requirements, while simultaneously recognizing that this discipline is but one of several competing components of the overall technology base. The subject of continuum fracture mechanics has received a high level of attention. Through the concept of critical fracture toughness, advances in experimental stress analysis and mathematical analysis of failure have been translated into a practical and improved method for dealing with fracture. The authors advocate renewed support of basic research for new concepts, and suggest five areas with potential for high payoff, including characterization of the 3-D singularity at a crack tip, the fracture phenomenon in composite materials, the connection between Weibull and Griffith failure theories, and design of materials to resist fracture. Additional high payoff basic and applied research areas include specific topics in adhesive fracture, defect implications in electro-optical systems, interdisciplinary approach to life prediction, probabilistic methods for structural integrity, and computational mechanics. GRA

N83-20297# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Ballistic Research Lab.
THREE-DIMENSIONAL OBLIQUE SHOCK DIFFRACTION OVER A RECTANGULAR PARALLELEPIPED: COMPUTATIONAL/EXPERIMENTAL COMPARISON Final Report, Jun. 1979 - Jan. 1982
Richard E. Lottero, John D. Wortman, Brian P. Bertrand, and Clarence W. Kitchens, Jr. Nov. 1982 68 p refs
(DA Proj. 1L1-62618-AH-80; DA Proj. 1L1-62618-AH-25)
(AD-A122254; AD-F300134; ARBRL-TR-02443) Avail: NTIS HC A04/MF A01 CSCL 19/4

Three dimensional, unsteady finite-difference calculations with the HULL hydrocode are used to describe the shock diffraction process resulting from a shock wave striking the front of a scaled model of an S-280 Electrical Equipment shelter at oblique incidence. The 52.5 degree obliquity of the incident 34.5 kPa (5 psi) overpressure shock on the front face produces a peak reflected overpressure that is approximately 50 percent larger than that for normal reflection. The numerical calculations are discussed and evaluated by comparison with experimental pressure measurements taken in shock tube tests on a scale-model shelter. Difficulties are experienced in both the 3-D calculations and the experiment in resolving the peak reflected overpressure on the front face.

Except for some disagreement in the values for peak overpressure on the shelter front and windward side faces, the comparisons between computed and experimentally measured pressure for all faces show good agreement. Three dimensional and two dimensional cell-size convergence studies are discussed which quantify the influence of cell size on the numerical results. GRA

N83-20298# AiResearch Mfg. Co., Torrance, Calif.
ANALYSIS OF THERMAL AND MECHANICAL STRESSES IN THE CERAMIC SEAL OF THE 1-MW(th) BENCH MODEL SOLAR RECEIVER Final Report
Feb. 1982 192 p refs Sponsored by EPRI
(EPRI Proj. 475-9)
(DE82-901870; EPRI-AP-2267) Avail: NTIS HC A09/MF A01

The thermal/mechanical stress levels associated with the hot tube to manifold ceramic joint for the 1-Mw/sub t/ bench model solar receiver (BMSR) was discussed and appropriate design and/or material changes for this joint were determined to provide an acceptably low probability of failure. To this end, thermal shock/thermal gradient and combined thermal/mechanical loading tests were designed, analytically modeled, experimentally carried out, and subsequently analyzed. Analysis of the BMSR ceramic joint design and materials revealed that a rather low probability of success would be expected. From the experiments performed it was deduced that the current disc material has an apparent Weibull modulus of three to five for the Si3N4 discs and slightly greater than ten for the SiC discs. The thermal resistance at the tube/disc interface was found to decrease significantly with the increased surface contact area due to hand lapping the tube into the disc seat. DOE

N83-20299# California Univ., Livermore. Lawrence Livermore Lab.
EFFECTS OF DESIGN VARIABLES ON THE CRITICAL STRESSES OF EYE BARS UNDER LOAD: AN EVALUATION BY PHOTOELASTIC MODELING
R. G. Scott and J. C. Stone 8 Jan. 1982 11 p refs Presented at the Joint Conf. on Exptl. Mech., Honolulu, Hawaii, 22-30 May 1982
(Contract W-7405-eng-48)
(DE82-010758; UCRL-87071; CONF-820516-2) Avail: NTIS HC A02/MF A01

The effects of major design variables on the critical stresses in eye bar lugs used for heavy lifting are considered. The critical stresses determined experimentally by the photoelastic modeling of design variations of geometry and pin clearance with and without a bushing between the pin and the lug are discussed. Experimental data are compared to values developed from theoretical analysis. DOE

N83-20300# Los Alamos Scientific Lab., N. Mex.
VALIDATION EXPERIENCES WITH A NONLINEAR SHELL OF REVOLUTION IN ADINA AND NONSAP
William A. Cook Feb. 1982 10 p refs
(Contract W-7405-eng-36)
(DE82-009183; LA-9237-MS) Avail: NTIS HC A02/MF A01

Validation problems for a nonlinear shell of revolution finite element model are described and tabulated. These problems prove this model to be versatile and accurate for solving problems, including nonlinear strain and materials and large rotations. Also, the Broyden Fletcher Goldfarb Shanno solution method in ADINA improves the convergence of this model in the more difficult problems. DOE

N83-20301# Knolls Atomic Power Lab., Schenectady, N. Y.
REYNOLDS STRESS MEASUREMENTS IN CYLINDRICAL GEOMETRY USING LASER DOPPLER ANEMOMETRY
D. M. Brudnoy, W. E. Moore, and G. J. Kirouac May 1982 22 p refs Presented at ASME Winter Ann. Meeting: Symp. on Engr. of Laser Velocimetry, Phoenix, Ariz., 14-19 Nov. 1982
(Contract DE-AC12-76SN-00052)
(DE82-014468; KAPL-4151; CONF-821101-4) Avail: NTIS HC A02/MF A01

Two component one point velocity correlation measurements in a cylindrical test section were performed using two-color Laser Doppler anemometry (LDA). In order to overcome the severe optical distortion effects in cylindrical geometry and achieve two color spatial coincidence, two experimental methods were used: (1) attaching a rectangular, fluid filled box to the pipe exterior; and (2) employing a laser beam translating device. A description of these methods and some examples of coincidence data taken in pipe flow are presented. DOE

N83-20302# Virginia Univ., Charlottesville.
SIMULATING THE CTR ENVIRONMENT IN THE HVEM Progress Report, 1 Oct. 1981 - 30 Jun. 1982
William A. Jesser 1982 39 p refs
(Contract DE-AS05-76ET-52023)
(DE82-021222; DOE/ET-52023-27) Avail: NTIS HC A03/MF A01

Neutron radiation effects on the tensile properties of Type 316 stainless steel are described. DOE

N83-20303# Argonne National Lab., Ill. Reactor Analysis and Safety Div.
COUPLED HEAT CONDUCTION AND THERMAL STRESS FORMULATION USING EXPLICIT INTEGRATION
A. H. Marchertas and R. F. Kulak Jun. 1982 31 p refs
(Contract W-31-109-eng-38)
(DE83-002321; ANL-82-47) Avail: NTIS HC A03/MF A01

The formulation needed for the conductance of heat by means of explicit integration is presented. The implementation of these expressions into a transient structural code, which is also based on explicit temporal integration, is described. Comparisons of theoretical results with code predictions are given both for one dimensional and two dimensional problems. The coupled thermal and structural solution of a concrete crucible, when subjected to a sudden temperature increase, shows the history of cracking. The extent of cracking is compared with experimental data. DOE

N83-20304# Pittsburgh Univ., Dept. of Civil Engineering.
ELASTIC-PLASTIC ANALYSIS FOR CYCLIC LOADING AND TRESCA YIELD CONDITION
Morteza A. M. Torkamani and Mohammad R. Pajand Jun. 1982 54 p refs
(Contract NSF PFR-80-01506)
(PB83-101048; SETEC-CE-82-009; NSF/CEE-82029) Avail: NTIS HC A04/MF A01 CSCL 20K

Von Mises and Tresca yield surfaces suitable for obtaining kinematic hardening formulations of the incremental theory of plasticity are presented. A uniaxial symmetric Tresca yield condition is utilized to formulate a displacement incremental theory of plasticity for material with equal and unequal tension and compression yield strength. Constitutive laws for plane stress problems based on the linear kinematic hardening and associated flow rule are derived for sides and corners of the yield surface. In this formulation, Ziegler's modification of Prager's rule was considered. Finite element formulation, numerical solution, and applications are discussed. GRA

N83-20305# Nevada Univ., Reno. Coll. of Engineering.
ANALYTICAL STUDY OF IRREGULAR R/C STRUCTURES SUBJECTED TO IN-PLANE EARTHQUAKE LOADS
Mehdi Saiidi and Kenneth E. Hodson, Jr. May 1982 163 p refs
(Grant NSF PFR-80-06423)
(PB83-100404; NSF/CEE-82027; College-of-Engineering-59) Avail: NTIS HC A08/MF A01 CSCL 13M

A version of a simple, single degree model, the Q-model, is used for approximate displacement response history calculation of irregular planar reinforced concrete frames subjected to earthquakes. Nonlinearity of the response is accounted for at an idealized base sprung with a set of simple hysteresis rules and a full scale hypothetical frame. The model is used to study the effect of several parameters on the seismic response. Effects of different earthquakes with the same spectral intensities (SI) on two structures are described. It is shown that neither SI nor peak

acceleration is adequate to signify the expected structural response. The effect of different wall cutoff points is studied and walls only a few stories high are found to provide sufficient resistance against excessive story drifts. GRA

N83-20306# Norges Tekniske Hoegskole, Trondheim. Forskningsinstitutet for Cement og Betong.
NON-LINEAR ANALYSIS OF CONCRETE STRUCTURES
Ivar Holand 25 Sep. 1981 22 p refs Presented at the Conf. on Contemp. European Concrete Res., Stockholm, 9-11 Jun. 1981
(PB83-107425) Avail: NTIS HC A02/MF A01 CSCL 13B

Mathematical modelling of the nonlinear behavior of concrete and reinforcement, finite element representation of the structure and formation and solution of resulting equations are discussed. The capability of the methods is demonstrated by examples of reinforced beams and plates. GRA

N83-20307# Poitiers Univ. (France). Lab. de Mecanique des Solides.
NONLINEAR PHOTOVISCOELASTICITY: THEORY AND MEASUREMENT
A. Tougui, D. Gamby, A. Lagarde, and H. Brinson, (Virginia Polytechnic Inst. and State Univ.) Aug. 1982 165 p refs Proposed for presentation at the 1983 SESA Spring Meeting, Cleveland Submitted for publication
(PB83-111484; VPI-E-82-21) Avail: NTIS HC A08/MF A01 CSCL 20K

Photoviscoelasticity and photoplasticity concepts are reviewed, and differences and similarities are discussed. The suggestion is made that a better understanding of nonlinear time varying birefringence enhances the utilization of polymeric materials for photoplasticity studies. A mathematical model for nonlinear photoviscoelasticity is presented. Measurements of optical creep and creep recovery are given, and comparisons between theory and experiments are made and discussed. GRA

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N83-20308*# California Univ., Berkeley. Space Sciences Lab.
DEVELOPMENT OF TECHNIQUES FOR PRODUCING STATIC STRATA MAPS AND DEVELOPMENT OF PHOTOINTERPRETIVE METHODS BASED ON MULTITEMPORAL LANDSAT DATA Quarterly Progress Report, 15 Feb. - 14 May 1977
Robert N. Colwell, Principal Investigator, Claire M. Hay, Randall W. Thomas, and Andrew S. Benson 5 Aug. 1977 79 p refs ERTS
(Contract NAS9-14565)
(E83-10156; NASA-CR-167761; NAS 1.26:167761; SSL-Ser-18-Issue-60) Avail: NTIS HC A05/MF A01 CSCL 08B

Progress in the evaluation of the static stratification procedure and the development of alternative photointerpretive techniques to the present LACIE procedure for the identification of training fields is reported. Statistically significant signature controlling variables were defined for use in refining the stratification procedure. A subset of the 1973-74 Kansas LACIE segments for wheat was analyzed. M.G.

N83-20309*# California Univ., Berkeley. Space Sciences Lab.
DEVELOPMENT OF TECHNIQUES FOR PRODUCING STATIC STRATA MAPS AND DEVELOPMENT OF PHOTOINTERPRETATION METHODS BASED ON MULTITEMPORAL LANDSAT DATA Monthly Summary Progress Report, 15 May - 14 Nov. 1976
Robert N. Colwell, Principal Investigator, Claire M. Hay, Randall W. Thomas, and Andrew S. Benson 15 Dec. 1976 104 p refs ERTS
(Contract NsG-14565)
(E83-10160; NASA-CR-167760; NAS 1.26:167760; SSL-Ser-Issue-2) Avail: NTIS HC A06/MF A01 CSCL 08B

The progress of research conducted in support of the Large Area Crop Inventory Experiment (LACIE) is documented. Specific tasks include (1) evaluation of the static stratification procedure and modification of that procedure if warranted, and (2) the development of alternative photointerpretative techniques to the present LACIE procedures for the identification and selection of training fields (areas). M.G.

N83-20310*# Missouri Univ., Columbia. Dept. of Atmospheric Sciences.
EVALUATION OF THOMPSON-TYPE TREND AND MONTHLY WEATHER DATA MODELS FOR CORN YIELDS IN IOWA, ILLINOIS, AND INDIANA
Vikki French, Principal Investigator Apr. 1982 88 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E83-10161; NASA-CR-170007; YM-12-04365; JSC-18576; NAS 1.26:170007) Avail: NTIS HC A05/MF A01 CSCL 02C

An evaluation was made of Thompson-Type models which use trend terms (as a surrogate for technology), meteorological variables based on monthly average temperature, and total precipitation to forecast and estimate corn yields in Iowa, Illinois, and Indiana. Pooled and unpooled Thompson-type models were compared. Neither was found to be consistently superior to the other. Yield reliability indicators show that the models are of limited use for large area yield estimation. The models are objective and consistent with scientific knowledge. Timely yield forecasts and estimates can be made during the growing season by using normals or long range weather forecasts. The models are not costly to operate and are easy to use and understand. The model standard errors of prediction do not provide a useful current measure of modeled yield reliability. M.G.

N83-20311*# Operations Research, Inc., Silver Spring, Md.
MRS PROOF-OF-CONCEPT ON ATMOSPHERIC CORRECTIONS. ATMOSPHERIC CORRECTIONS USING AN ORBITAL POINTABLE IMAGING SYSTEM Final Report, 15 May 1979 - 15 Jan. 1980
Philip N. Slater, Principal Investigator Jan. 1980 88 p refs ERTS
(Contract NAS5-25606)
(E83-10173; NASA-CR-170488; NAS 1.26:170488; ORI-TR-1653) Avail: NTIS HC A05/MF A01 CSCL 04A

The feasibility of using a pointable imager to determine atmospheric parameters was studied. In particular the determination of the atmospheric extinction coefficient and the path radiance, the two quantities that have to be known in order to correct spectral signatures for atmospheric effects, was simulated. The study included the consideration of the geometry of ground irradiance and observation conditions for a pointable imager in a LANDSAT orbit as a function of time of year. A simulation study was conducted on the sensitivity of scene classification accuracy to changes in atmospheric condition. A two wavelength and a nonlinear regression method for determining the required atmospheric parameters were investigated. The results indicate the feasibility of using a pointable imaging system (1) for the determination of the atmospheric parameters required to improve classification accuracies in urban-rural transition zones and to apply in studies of bidirectional reflectance distribution function data and polarization effects; and (2) for the determination of the spectral reflectances of ground features. M.G.

N83-20312*# California Univ., Berkeley. Space Sciences Lab.
LABELING RESEARCH IN SUPPORT OF THROUGH-THE-SEASON AREA ESTIMATION Final Report, 15 Nov. 1980 - 30 Jun. 1982
R. N. Colwell, Principal Investigator, C. M. Hay, and E. J. Sheffner Nov. 1982 103 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior, and Agency for International Development ERTS
(Proj. AgRISTARS; Contract NAS9-14565)
(E83-10190; NASA-CR-167804; SR-B2-04375; NAS 1.26:167804) Avail: NTIS HC A06/MF A01 CSCL 02C

The development of LANDSAT-based through-the-season labeling procedures for corn and soybeans is discussed. A model for predicting labeling accuracy within key time periods throughout the growing season is outlined. Two methods for establishing the starting point of one key time period, viz., early season, are described. In addition, spectral-temporal characteristics for separating crops in the early season time period are discussed.
M.G.

N83-20313*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THEMATIC MAPPER DATA QUALITY AND PERFORMANCE ASSESSMENT IN RENEWABLE RESOURCE/AGRICULTURAL REMOTE SENSING
J. D. Erickson and R. B. MacDonald, Principal Investigators 15 Sep. 1982 126 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E83-10191; NASA-TM-85242; IT-12-04369; JSC-18579; NAS 1.15:85242) Avail: NTIS HC A07/MF A01 CSCL 02C

A 'quick look' investigation of the initial LANDSAT-4, thematic mapper (TM) scene received from Goddard Space Flight Center was performed to gain early insight into the characteristics of TM data. The initial scene, containing only the first four bands of the seven bands recorded by the TM, was acquired over the Detroit, Michigan, area on July 20, 1982. It yielded abundant information for scientific investigation. A wide variety of studies were conducted to assess all aspects of TM data. They ranged from manual analyses of image products to detect obvious optical, electronic, or mechanical defects to detailed machine analyses of the digital data content for evaluation of spectral separability of vegetative/nonvegetative classes. These studies were applied to several segments extracted from the full scene. No attempt was made to perform end-to-end statistical evaluations. However, the output of these studies do identify a degree of positive performance from the TM and its potential for advancing state-of-the-art crop inventory and condition assessment technology.
M.G.

N83-20314*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PROGRAM REVIEW PRESENTATION TO LEVEL 1, INTERAGENCY COORDINATION COMMITTEE Semiannual Review, 30 Apr. - 30 Sep. 1982
29 Nov. 1982 135 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior, amd Agency for International Development ERTS
(Proj. AgRISTARS)
(E83-00192; IT-J2-04378; JSC-18581; NAS 1.15:85243; SAR-6) Avail: NTIS HC A07/MF A01 CSCL 02C

Progress in the development of crop inventory technology is reported. Specific topics include the results of a thematic mapper analysis, variable selection studies/early season estimator improvements, the agricultural information system simulator, large unit proportion estimation, and development of common features for multi-satellite information extraction.
M.G.

N83-20315*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
USE OF NOAA-N SATELLITES FOR LAND/WATER DISCRIMINATION AND FLOOD MONITORING
G. Tappan, N. C. Horvath, P. C. Doraiswamy, T. Engman (Dept. of Agriculture, Houston, Tex.), and D. W. Goss, Principal Investigators (Dept. of Agriculture, Houston, Tex.) Jan. 1983 37 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior, and Agency for International Development ERTS
(Proj. AgRISTARS; Contract NAS9-15800)
(E83-10193; NASA-CR-167812; EW-L3-04394; JSC-18594; NAS 1.26:167812; LEMSCO-19032) Avail: NTIS HC A03/MF A01 CSCL 02C

A tool for monitoring the extent of major floods was developed using data collected by the NOAA-6 advanced very high resolution radiometer (AVHRR). A basic understanding of the spectral returns in AVHRR channels 1 and 2 for water, soil, and vegetation was reached using a large number of NOAA-6 scenes from different seasons and geographic locations. A look-up table classifier was developed based on analysis of the reflective channel relationships for each surface feature. The classifier automatically separated land from water and produced classification maps which were registered for a number of acquisitions, including coverage of a major flood on the Parana River of Argentina.
M.G.

N83-20316*# Aster Consulting Associates, Binghamton, N.Y.
BIOPHYSICAL AND SPECTRAL MODELING Final Report
Narendra S. Goel, Principal Investigator 1 Dec. 1982 14 p ERTS
(Contract NAS9-16662)
(E83-10194; NASA-CR-167808; NAS 1.26:167808) Avail: NTIS HC A02/MF A01 CSCL 02C

Activities and results of a project to develop strategies for modeling vegetative canopy reflectance are reported. Specific tasks included the inversion of canopy reflectance models to estimate agronomic variables (particularly leaf area index) from in-situ reflectance measurements, and a study of possible uses of ecological models in analyzing temporal profiles of greenness.
M.G.

N83-20317*# Texas A&M Univ., College Station. Inst. of Statistics.
AREA ESTIMATION USING MULTIYEAR DESIGNS AND PARTIAL CROP IDENTIFICATION Final Report, 1 Mar. 1981 - 31 Dec. 1982
R. L. Sielken, Jr. Jan. 1983 16 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-13894; Proj. AgRISTARS)
(E83-10195; NASA-CR-167806; IT-T3-04395; NAS 1.26:167806) Avail: NTIS HC A02/MF A01 CSCL 02C

Progress is reported for the following areas: (1) estimating the stratum's crop acreage proportion using the multiyear area estimation model; (2) assessment of multiyear sampling designs; and (3) development of statistical methodology for incorporating partially identified sample segments into crop area estimation.
M.G.

N83-20318*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
LINEAR DISCRIMINANT ANALYSIS WITH MISALLOCATION IN TRAINING SAMPLES
R. Chhikara, Principal Investigator and Jim McKeon (Old Dominion Univ.) Dec. 1982 34 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E83-10196; NASA-CR-167813; SR L3-04388; JSC-18590; NAS 1.26:167813; LEMSCO-19020) Avail: NTIS HC A03/MF A01 CSCL 02C

Linear discriminant analysis for a two-class case is studied in the presence of misallocation in training samples. A general appraoch to modeling of mislocation is formulated, and the mean vectors and covariance matrices of the mixture distributions are derived. The asymptotic distribution of the discriminant boundary is obtained and the asymptotic first two moments of the two types of error rate given. Certain numerical results for the error rates are presented by considering the random and two non-random misallocation models. It is shown that when the allocation

procedure for training samples is objectively formulated, the effect of misallocation on the error rates of the Bayes linear discriminant rule can almost be eliminated. If, however, this is not possible, the use of Fisher rule may be preferred over the Bayes rule. M.G.

N83-20319*# State Univ. of New York, Binghamton. Dept. of Systems Science.

MODELING OF VEGETATION CANOPY REFLECTANCE: STATUS, ISSUES AND RECOMMENDED FUTURE STRATEGY

Narendra S. Goel, ed. 30 Aug. 1982 84 p refs Prepared for Lockheed Engineering and Management Services Co., Inc., Houston, Tex. ERTS

(Contract NAS9-15800)

(E83-10197; NASA-CR-167816; JSC-18666; NAS 1.26:167816) Avail: NTIS HC A05/MF A01 CSCL 02F

Various technical issues related to mapping of vegetative type, condition and stage of maturity, utilizing remotely sensed spectral data are reviewed. The existing knowledge base of models, especially of rarliative properties of the vegetation canopy and atmosphere, is reviewed to establish the state of the art for addressing the problem of vegetation mapping. Activities to advance the state of the art are recommended. They include working on canopy reflectance and atmospheric scattering models, and field measurements of canopy reflectance as well as of canopy components. Leaf area index (LAI) and solar radiation interception (SRI) are identified as the two most important vegetation variables requiring further investigation. It is recommended that activities related to sensing them or understanding their relationships with measurable variables, should be encouraged and supported. M.G.

N83-20320*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

ON THE ERROR IN CROP ACREAGE ESTIMATION USING SATELLITE (LANDSAT) DATA

R. Chhikara, Principal Investigator Jan. 1983 24 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E83-10193; NASA-CR-167811; SR-L3-04389; JSC-18591; NAS 1.26:167811; LEMSCO-19021) Avail: NTIS HC A02/MF A01 CSCL 02C

The problem of crop acreage estimation using satellite data is discussed. Bias and variance of a crop proportion estimate in an area segment obtained from the classification of its multispectral sensor data are derived as functions of the means, variances, and covariance of error rates. The linear discriminant analysis and the class proportion estimation for the two class case are extended to include a third class of measurement units, where these units are mixed on ground. Special attention is given to the investigation of mislabeling in training samples and its effect on crop proportion estimation. It is shown that the bias and variance of the estimate of a specific crop acreage proportion increase as the disparity in mislabeling rates between two classes increases. Some interaction is shown to take place, causing the bias and the variance to decrease at first and then to increase, as the mixed unit class varies in size from 0 to 50 percent of the total area segment. M.G.

N83-20321*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

RELATION OF AGRONOMIC AND MULTISPECTRAL REFLECTANCE CHARACTERISTICS OF SPRING WHEAT CANOPIES

Marvin E. Bauer, Principal Investigator and J. S. Ahlrichs Dec. 1982 29 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15466; Proj. AgRISTARS)

(E83-10199; NASA-CR-167805; SR-P2-04384; NAS 1.26:167805; LARS-12082) Avail: NTIS HC A03/MF A01 CSCL 02C

The relationships between crop canopy variables such as leaf area index (LAI) and their multispectral reflectance properties were investigated along with the potential for estimating canopy variables from remotely sensed reflectance measurements. Reflectance spectra over the 0.4 to 2.5 micron wavelength range were acquired during each of the major development stages of spring wheat canopies at Williston, North Dakota, during three seasons. Treatments included planting date, N fertilization, cultivar, and soil moisture. Agronomic measurements included development stage, biomass, LAI, and percent soil cover. High correlations were found between reflectance and percent cover, LAI, and biomass. A near infrared wavelength band, 0.76 to 0.90 microns, was most important in explaining variation in LAI and percent cover, while a middle infrared band, 2.08 to 2.35 microns, explained the most variation in biomass and plant water content. Transformations, including the near infrared/red reflectance ratio and greenness index, were also highly correlated to canopy variables. The relationship of canopy variables to reflectance decreased as the crop began to ripen. the canopy variables could be accurately predicted using measurements from three to five wavelength bands. The wavelength bands proposed for the thematic mapper sensor were more strongly related to the canopy variables than the LANDSAT MSS bands. M.G.

N83-20322*# Texas A&M Univ., College Station. Remote Sensing Center

DEVELOPMENT OF AN EARLY WARNING SYSTEM OF CROP MOISTURE CONDITIONS USING PASSIVE MICROWAVE Final Report, 1 Nov. 1981 - 31 Oct. 1982

Marshall J. McFarland and Paul H. Harder, II, Principal Investigators Nov. 1982 119 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-16556; Proj. AgRISTARS)

(E83-10200; NASA-CR-167820; SR-T2-04383; NAS 1.26:167820) Avail: NTIS HC A06/MF A01 CSCL 02C

Emissivities were calculated from the Nimbus 5 electrically scanning microwave radiometer (ESMR) over 25 km grid cells for the southern Great Plains includin the western two-thirds of Kansas and Oklahoma and northwest Texas. These emissivities, normalized for seasonal temperature changes, were in excellent agreement with theory and measurements made from aircraft and truck sensors at the 1.55 cm wavelength of ESMR. These emissivities were related to crop moisture conditions of the winter wheat in the major wheat producing counties of the three states. High correlations were noted between emissitivity and an antecedent precipitation index (API) used to infer soil moisture for periods when the soils were essentially bare. The emissivities from ESMR were related through API and actual crop condition reports to progress of fall planting, adequacy of crop moisture for stand establishment, and periods of excessive moisture that necessitated replanting. Periods of proloned frozen soil in the winter were observable at several grid points. The average emissivities of the canopy/soil surface during the maximum canopy development times in the spring showed a good agreement with moisture stress inferred from rainfall and yield data. M.G.

N83-20323# Agricultural Research Center, Beltsville, Md. Water Data Lab.

HYDROLOGIC DATA FOR EXPERIMENTAL AGRICULTURAL WATERSHEDS IN THE UNITED STATES, 1972

James B. Burford, comp., Jane L. Delashmutt, comp., and Ralph T. Roberts, comp. Sep. 1981 437 p

(MP-1412) Avail: NTIS HC A19/MF A01

Hydrologic data from 131 agricultural watersheds for calendar year 1972 are summarized in this publication. Daily and monthly total precipitation and streamflow together with annual maximum peak discharge and maximum runoff for selected time intervals are included. Watershed descriptive information is presented. Maximum and minimum daily temperatures are given for many of the watersheds. Author

N83-20324*# National Aeronautics and Space Administration. Pasadena Office, Calif.

METHOD AND APPARATUS FOR CONTOUR MAPPING USING SYNTHETIC APERTURE RADAR Patent Application

Richard M. Goldstein (JPL, California Inst. of Tech., Pasadena), Edward R. Caro (JPL, California Inst. of Tech., Pasadena), and Chialin Wu, inventors (to NASA) (JPL, (California Inst. of Tech., Pasadena) Filed 10 Feb. 1983 17 p
(Contract NAS7-100)
(NASA-Case-NPO-15939-1; US-Patent-Appl-SN-465365) Avail: NTIS HC A02/MF A01 CSCL 08B

By using two SAR antennae spaced a known distance and oriented at substantially the same look angle to illuminate the same target area, pixel data from the two antennae are compared in phase to determine a difference from which a slant angle is determined for each pixel point. The height of each pixel point from the aircraft is determined, and from the known altitude of the aircraft above sea level, the altitude (elevation) of each point is determined. NASA

N83-20325# Geological Survey, Boise, Idaho. Water Resources Div.
WATER RESOURCES DATA FOR IDAHO, WATER YEAR 1981. VOLUME 1: GREAT BASIN AND SNAKE RIVER BASIN ABOVE KING HILL
Jun. 1982 459 p
(PB83-103416; USGS-WRD-ID-81-1-Vol-1; USGS/WRD-HUD-81-047-Vol-1) Avail: NTIS HC A20/MF A01 CSCL 08H

Water resources data for the 1981 water year for Idaho consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. Discharge records for 204 gaging stations; stage only records for 2 gaging stations; stage only for 11 lakes and reservoirs; contents only for 16 lakes and reservoirs; water quality for 84 gaging stations, 77 partial-record stations, 138 wells, and 5 precipitation sites; and water levels for 469 observation wells are given. Also included are data for 38 crest-stage partial-record stations. Author (GRA)

N83-20326# Defense Mapping Agency Hydrographic and Topographic Center, Washington, D.C.
THE GEODETIC ACTIVITIES OF THE DEPARTMENT OF DEFENSE UNDER THE INTERNATIONAL GEOPHYSICAL YEAR PROGRAMS
Owen W. Williams and Kenneth I. Daugherty Dec. 1982 19 p refs
(AD-A122057) Avail: NTIS HC A02/MF A01 CSCL 08/5

The International Geophysical Year (IGY) programs have special significance to geodesists. The IGY witnessed the launching of the first manmade Earth satellite and the beginning of the era of global geodesy. It is no wonder that the U.S. Department of Defense (DoD) with its global requirements developed an early interest in satellite geodesy. Specifically, this led to the use of early satellites of opportunity (and subsequently of dedicated satellites) for worldwide navigation, geodetic positioning and gravimetric investigations. In conjunction with other civilian satellite programs under the IGY, DoD played a major role in the achievement of geodetic goals, perhaps far beyond that which was envisioned originally. GRA

N83-20327# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology, Forestry and Wildlife.
USE OF VEGETATION IN DELINEATING WETLAND BORDERS IN UPPER MISSOURI RIVER BASIN: NORTH-CENTRAL UNITED STATES Final Report
W. Carte Johnson, Richard A. Mayes, and Terry L. Sharik Vicksburg, Miss. Army Engineer Waterways Experiment Station Aug. 1982 137 p refs
(Contract DACW39-78-C-0098)
(AD-A120798; WES-TR-Y-82-1) Avail: NTIS HC A07/MF A01 CSCL 08/6

Wetland-nonwetland transition zones in the Missouri River Basin of the north-central United States were studied in seven wetlands ranging in size, permanence, and salinity to develop an efficient sampling methodology that utilized vegetation data to delineate wetland boundaries. One hundred and sixty species of vascular plants occurred in twenty sample transects. Sampling methodology suggested for use in the study area (200-km radius of Sioux Falls, South Dakota) is a combination of the belt transect method (contiquous quadrats) to estimate cover by species and a cover board to measure vertical structure. The methods require a combined sampling time of about 9 min/m of transect, corresponding to a sampling time of 3.2 hr for a transect of average length. A streamlined methodology was also devised whereby sampling time could be cut in half. General upper and lower borders of the transition zone were determined from direct gradient analysis graphs. Specific borders were determined from the occurrence of compositional dichotomies displayed in ordination models. GRA

N83-20328# Alaska Univ., Fairbanks.
A LITERATURE SURVEY ON THE WETLAND VEGETATION OF ALASKA Final Report
Alan R. Batten and David F. Murray Vicksburg, Miss. Army Engineering Waterways Experiment Station Aug. 1982 236 p refs
(Contract DACW39-76-M-2473)
(AD-A120573; WES-TR-Y-82-2) Avail: NTIS HC A11/MF A01 CSCL 08/6

This literature survey contains published information on wetlands vegetation of Alaska prior to September, 1977. The literature review and summaries are organized under the broad habitat categories of: (a) freshwater wetlands (ponds and lakes, freshwater marshes, peatlands, streams, and riparian gravel bars and cutbanks), and (b) saline or brackish water wetlands (strands and supratidal meadows, saline or brackish marshes, and intertidal zones). The floristics and vegetation of these categories are discussed on a regional basis which includes Southeastern Alaska, Southeastern Alaska, Southcentral Alaska, Aleutian Islands, Bering Sea Islands, Bering Sea Mainland, Chukchi Sea, Beaufort Sea, and Interior Alaska. Author (GRA)

N83-20329# National Academy of Sciences - National Research Council, Washington, D. C. Ocean Sciences Board.
TWO SPECIAL ISSUES IN SATELLITE OCEANOGRAPHY
1982 40 p refs
(AD-A121442) Avail: NTIS HC A03/MF A01 CSCL 08/3

This report highlights two areas, ocean dynamics and biological oceanography, that we believe are ripe for special emphasis. The excitement and potential of the new satellite technology already show in some of the recent oceanographic literature, and they have spurred reports and recommendations by other units of the National Research Council. We add our endorsement to that report from the perspective of the oceanographic community and add our emphasis that such studies will also require in situ measurements. Long lead times are required for the establishment of new satellite programs. Therefore, in order to achieve the enormous and unique potential of this new technology we must take steps now to plan for the new programs and arrange for multiagency support of the needed research and development. We hope that the two reports presented here will help to stimulate this process. GRA

N83-20330# SRI International Corp., Menlo Park, Calif.
REVIEW OF THAWTRON DEVICE FOR THAWING FROZEN COAL Final Report
W. A. Edson and G. E. Tallmadge Mar. 1982 87 p refs Sponsored by DOE and Electric Power Research Inst.
(DE82-903145; EPRI-CS-2253) Avail: NTIS HC A05/MF A01

The use of microwave energy to thaw frozen coal and the THAWTRON device, which was proposed for this purpose are discussed. Microwave and thermal properties of coal and other materials are reviewed as a guide to the feasibility of the proposed method. Microwave thawing is compared with mechanical devices, radiant heaters, and freeze conditioning agents as an aid to unloading cars of frozen coal. It is concluded that development of a full size THAWTRON device involves high technical risk and that microwaves are unlikely to be cost effective in comparison to other available techniques for unloading frozen coal. DOE

N83-20331# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
PEAT RESOURCE ESTIMATION IN GEORGIA
R. J. Didocha Apr. 1982 9 p refs Presented at 5th Tech. Conf. on Peat, Bethesda, Md., 27 Apr. 1982
(Contract DE-FG18-80FC-10502)
(DE82-014415; CONF-820453-1) Avail: NTIS HC A02/MF A01

The objective was to determine the amount and location of fuel-grade peat in Georgia that may be harvested and utilized in an environmentally acceptable manner. The 4 tasks undertaken the first year were to assess existing data and prioritize peat areas to be surveyed in Georgia, identify sampling procedures and strategy, identify and procure needed equipment and supplies, and perform a preliminary peat resource estimation. The status of the work accomplished to date is summarized. DOE

N83-20332# Rockwell International Corp., Richland, Wash. Energy systems Group.
HYDROLOGIC TESTING METHODOLOGY AND RESULTS FROM DEEP BASALT BOREHOLES
S. R. Strait, F. A. Spane, R. L. Jackson, and W. W. Pidcoe May 1982 24 p refs Presented at Geolog. Soc. of Am. Rocky Mt. Sect. Meeting, Bozeman, Mont., 7-8 May 1982
(Contract DE-AC06-77RL-01030)
(DE82-014092; RHO-BW-SA-189; CONF-820550-2) Avail: NTIS HC A02/MF A01

The hydrologic field gathering activities, specifically, field-testing methdology and test results from deep basalt boreholes are discussed. The hydrologic field testing program provides data for characterization of the groundwater systems within the Pasco Basin that are significant to understanding waste isolation. The areal and vertical distributions of hydraulic head, hydraulic properties, and hydrochemistry are characterized. Data obtained from these studies provide input for numerical modeling of groundwater flow and solute transport. These models are used to evaluae potential waste migration as a function of space and time. The groundwater system beneath the Hanford Site and surrounding area consists of a thick, accordantly layered sequence of basalt flows and associated sedimentary interbed that primarily occur in the upper part of the Columbia River basalt. The columnar interiors of a flow act as low permeability aquitards, separating the more permeable interflows or interbeds. DOE

N83-20333# Department of Energy, Bartlesville, Okla. Energy Technology Center.
BARTLESVILLE ENERGY TECHNOLOGY CENTER ENHANCED OIL RECOVERY PROJECT DATA BASE
Mar. 1982 88 p
(DE82-012568; DOE/BETC-SP-82/6) Avail: NTIS HC A05/MF A01

The BETC Enhanced Oil Recovery Data Base is currently being developed to provide an information resource to accelerate the advancement and applications of EOR technology. The primary initial sources of data have been the incentive and Cost-Shared Programs. The data base greatly contains information on 607 EOR projects. This includes 410 of the approximately 423 projects which operators originally applied for certification with the Incentive Program; 20 EOR projects under the Cost-Shared Program; and a data base relating to 177 projects developed by Gulf Universities Research Consortium. In addition, relevant data from all previous DOE-funded contractor EOR data bases will be integrated into the BETC data base. Data collection activities from publicly available information sources is continuing on an on-going basis to insure the accuracy and timeliness of the information within the data base. The BETC data base is being developed utilizing a commercial data base management system. DOE

N83-20334# New York Univ., New York. Dept. of Economics.
WORLD OIL MODEL DEVELOPMENT Progress Report
Dermot Gately 20 Mar. 1982 38 p
(Contract DE-AC02-81PE-70326)
(DE82-013979; DOE/PE-70326-2; PR-2) Avail: NTIS HC A03/MF A01

A revised and updated model of the world oil market is described. The variables and equations in the model are listed. Illustrative projections are presented. The model's historical results are compared with actual historical data for 1973 to 1980. DOE

N83-20335# Arizona Univ., Tucson. Office of Arid Lands Studies.
ASSESSMENT OF ARID LANDS PLANTS AS FUTURE ENERGY CROPS FOR THE ELECTRIC UTILITY INDUSTRY
Kenneth E. Foster and William H. Brooks Dec. 1981 73 p refs Sponsored by Electric Power Research Inst.
(DE82-901909; EPRI-AP-2172-SR) Avail: NTIS HC A04/MF A01

The prospects of utilizing selected native arid lands plant species (terpene and nonterpene containing species) as future renewable energy resources, especially by US electric utilities are discussed. Some major problems that must be resolved before these energy sources can become dependable supplies are discussed. The assessment includes descriptions of the processing and production technologies associated with the various plant species as well as recommendations for research procedures and development programs specific to arid lands. Suggestions about the agronomic and economic parameters of growing these plants as energy source crops are also included. DOE

N83-20336# Stanford Univ., Calif. Dept. of Operations Research.
MODELING WATER SUPPLY FOR THE ENERGY SECTOR Final Report
N. Buras Feb. 1982 199 p refs Sponsored by DOE and EPRI
Avail: NTIS HC A09/MF A01

The construction of the WATER-EPM (W-EPM) model which is the energy policy Model (EPM) enlarged to include quantitative descriptions of water availabilites is summarized. To maintain the original structure of EPM, water supply functions are estimated on the basis of information available for the investment required to build storage facilities which can yield the next increment of flow available. A second important feature of the linkage of water and energy submodels in W-EPM is the estimation of a water transportation matrix. The W-EPM includes projections of nonenergy water uses, as a surrogate for water demand functions. Computer test with W-EPM indicat that in the Lower Colorado, Upper Colorado, Great Basin, and Platte-Lower Missouri regions shortages of water may occur as early as the current decade. California, Rio Grande, Texas-Gulf, and Upper Missouri regions may experience water shortages before the end of this century. Early in the next century, the Great Lakes-Ohio, Upper Mississippi, Pacific Northwest, and Arkansas-Lower-Mississippi regions may develop water shortages. DOE

N83-20337# Bendix Field Engineering Corp., Grand Junction, Colo.
PLTSYM: A FORTRAN COMPUTER SYSTEM TO PLOT CANADIAN SYMBOL LOCATION MAPS FOR HYDROGEOCHEMICAL AND STREAM-SEDIMENT RECONNAISSANCE DATA
R. J. Zinkl, D. L. Shettel, Jr., and R. F. DAndrea, Jr. Sep. 1982 141 p refs
(Contract DE-AC13-76GJ-01664)
(DE83-000764; GJBX-193-82) Avail: NTIS HC A07/MF A01

The PLTSYM system plots sample location maps on a line plotter at virtually any scale with data point values represented by one of 15 Canadian symbols. Sample location data can be in latitude/longitude or (X,Y) coordinate form. Five map projections are available for converting latitude/longitude into easting/northing coordinates. Data values can be sorted into classes using any one of four different class interval options. DOE

N83-20338# Indian Inst. of Tech., New Delhi. Dept. of Applied Mechanics.
A STUDY OF THE DETERMINATION OF WHEAT CROP STATISTICS IN INDIA THROUGH THE UTILIZATION OF LANDSAT DATA Ph.D. Thesis
Manosh Kumar Munshi 1982 161 p refs
(PB83-109546) Avail: NTIS HC A08/MF A01 CSCL 02B

The major drawbacks of the Indian crop information system

and the problems of crop monitoring in the country utilizing remote sensing technology are discussed. An operational methodology is developed for deriving wheat crop acreage statistics directly from LANDSAT Multispectral Scanner data, utilizing manual visual techniques. GRA

N83-20339# Bureau of Mines, Denver, Colo. Minerals Availability Field Office.

MANGANESE AVAILABILITY, DOMESTIC. A MINERALS AVAILABILITY SYSTEM APPRAISAL

Catherine C. Kilgore and Paul R. Thomas Jul. 1982 21 p refs (PB83-103176; BM-IC-8889; LC-82-600167) Avail: NTIS HC A02/MF A01 CSCL 08I

The Bureau of Mines investigated the availability of manganese from known domestic occurrences. Eight of these deposits were found to have demonstrated resources totaling 420 million metric tons with an average grade of 10 percent contained manganese. They were found to be submarginally subeconomic. Economic evaluations of the eight deposits resulted in incentive prices ranging from $8 to almost $35 per long ton unit (22.4 pounds) of contained manganese. Comparing these prices with the current maket value of $1.70 per long ton unit of manganese clearly illustrates the submarginal nature of the domestic ores analyzed. These domestic resources would probably not be developed except in the case of an extreme national emergency. Production from the eight deposits would take 3 to 6 years to develop, and the final product would be manganese ore concentrate, which could be used in the production of ferromanganese. Author (GRA)

N83-20340# Guam Univ., Agana. Water and Energy Research Inst. of the Western Pacific.

REMOTE SENSING OF WATER RESOURCES ON PACIFIC ISLANDS

Dinshaw N. Contractor Jun. 1982 23 p refs
(Contract DI-14-34-0001-1112)
(PB83-108019; W83-00262; OWRT-A-023-GUAM(2)) Avail: NTIS HC A02/MF A01 CSCL 13B

The value of the LANDSAT data base for locating additional fresh water resources on remote Pacific Islands was assessed, with specific attention given to a classification of land and water resources for Palau. Analysis of the neighboring islands, Peleliu, and Anguar. The promenent land cover features were identified and their areas obtained. Areas having potential value as additional fresh water sources were identified. The larger water resources included the water supply reservoir, the major rivers feeding into Karamado Bay, the Anguar phosphate mines, and the marine lakes in the rock islands. LANDSAT data obtained over Pacific islands was deemed very useful for locating additional water resources. GRA

N83-20341# Geological Survey, Albany, N.Y. Water Resources Div.

WATER RESOURCES DATA, NEW YORK, WATER YEAR 1981. VOLUME 1: EASTERN NEW YORK EXCLUDING LONG ISLAND Annual Report, 1 Oct. 1980 - 30 Sep. 1981

May 1982 334 p refs Sponsored in part by state of New York
(PB83-107334; USGS/WRD/HD-81/108-Vol-1;
USGS-WRD-NY-81-1-Vol-1) Avail: NTIS HC A15/MF A01 CSCL 08H

Water resources data for the 1981 water year for New York consist of records of stage, discharge, and water quality of steams; stage, contents, and water quality of lakes and reservoirs; and water levels of groundwater wells. This volume contains records for water discharge at 105 gaging stations; stage only at 6 gaging stations; and stage and contents at 4 gaging stations and 19 other lakes and reservoirs; water quality at 29 gaging stations, 5 precipitation stations and 4 partial-record stations; and water levels at 23 observation wells. Also included are data for 50 crest-stage and 14 low-flow partial-record stations. Additional water data were collected at various sites not involved in the systematic data-collection program and are published as miscellaneous measurements and analyses. Author (GRA)

N83-20342# Foersvarets Forskingsansalt, Stockholm (Sweden).

THE IMPORTANCE OF SATISFACTORY POSITIONING, DIVING AND MAPPING SYSTEMS SUITABLE FOR EXPLORATION AND TRANSPORTATION IN ICECOVERED SEA AREAS

Ragnar Toren Aug. 1982 68 p refs
(PB83-109587; FOA-B-60003-M7; ISBN-91-7056-063-3) Avail: NTIS HC A04/MF A01 CSCL 08L

In an introductory chapter (1) the author presents a general view of the remarkable evolution of the remote sensing technique during the last decades, all of great importance for operations in more or less ice-covered sea areas, especially at the exploration of natural resources, such as oil, gas and minerals, and at surface shipping as well as under-ice navigation. In all cases the best possible position-fixing and a true knowledge of the bathymetry and prevailing ice conditions are necessary. Also included in the report are chapters on: Exploration of the Arctic Ocean; Underwater Pingoes, Offshore Permafrost and Ground ice; and Underwater Technology. GRA

N83-20343# Geological Survey, Harrisburg, Pa. Water Resources Div.

WATER RESOURCES DATA FOR PENNSYLVANIA WATER YEAR 1981. VOLUME 2: SUSQUEHANNA AND POTOMAC RIVER BASINS Annual Water-Data Report, 1 Oct. 1980 - 30 Sep. 1981

Jun. 1982 349 p refs Sponsored in part by the state of Pennsylvania
(PB83-109959; USGS-WDR-PA-81-2-Vol-2;
USGS/WRD/HD-81/028-Vol-2) Avail: NTIS HC A15/MF A01 CSCL 08H

Water resources data for the 1981 water year for Pennsylvania consist of records of discharge and water quality of streams; contents of lakes and reservoirs; and water levels of ground water wells. Records for water discharge at 96 stations; contents at 13 lakes and reservoirs; water quality at 39 gaging stations; and water levels at 26 observation wells are given. Also included are data for 19 crest stage, and 120 water quality partial record stations. Author (GRA)

N83-20344# Geological Survey, Lakewood, Colo. Water Resources Div.

WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1981. VOLUME 1: MISSOURI RIVER BASIN, ARKANSAS RIVER BASIN, AND RIO GRANDE BASIN Annual Water Data Report, 1 Oct. 1980 - 30 Sep. 1981

Aug. 1982 503 p 3 Vol.
(PB83-110874; USGS/WRD/CO-81-1-Vol-1;
USGS/WRD/HD-82-034-Vol-1) Avail: NTIS HC A22/MF A01 CSCL 08H

Water resources data for Colorado for the 1981 water year consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs, and water levels and water quality of wells and springs. Discharge records for about 460 gaging stations, stage and contents of 22 lakes and reservoirs, 4 partial record low flow stations, 30 crest stage partial record stations, and 50 miscellaneous sites; water quality for 163 gaging stations and 300 miscellaneous sites; and water levels for 55 observation wells are given. Author (GRA)

N83-20345# Purdue Univ., Lafayette, Ind. Water Research Center.

STOCASTIC DAILY PRECIPITATION MODELING AND DAILY STREAMFLOW TRANSFER PROCESSES

Tiao J. Chang, M. Levent Kavvas, and Jacques W. Delleur Jun. 1982 290 p refs
(Contract DI-14-34-0001-0219)
(PB83-108191; W83-00282; OWRT-B-112-IND(1)) Avail: NTIS HC A13/MF A01 CSCL 08H

Research studies were carried out to examine the behavior of floods and droughts, and to provide characteristics of run lengths of wet and dry periods which are used to physically interpret flood and drought properties. This was approached through the modeling of daily hydrological series, with the models applied to several

Indiana locations. Two newly-defined stochastic processes are constructed: the binary discrete autoregressive moving average (modeling the wet-dry precipitation sequence) mixed with an exponential distribution to express the precipitation magnitude (B-DARMA-E); and the multi-stage discrete autoregressive moving average process (M-DARMA). Both processes are used to model daily precipitation time series in Indiana. Author (GRA)

N83-20346# Kentucky Water Resources Research Inst., Lexington.

GROUNDWATER IN THE INNER BLUEGRASS KARST REGION, KENTUCKY Research Report, Oct. 1978 - Sep. 1981

John Thrailkill, Lawrence E. Spangler, William M. Hopper, Jr., Michael R. McCann, and Joseph W. Troester Aug. 1982 147 p refs

(Contract DI-14-34-0001-9155)

(PB83-108126; W83-00275; OWRT-B-064-KY(1); RR-136) Avail: NTIS HC A07/MF A01 CSCL 08H

The use of water tracing and other techniques served to characterize the hydrogeology of about 12% of the Inner Bluegrass Karst Region (5600 sq km) of central Kentucky. Using fluorescent dyes 96 traces resulted in the identification of 38 groundwater basins having areas up to 15 sq km. Subsurface basin flow is in a dendritic conduit system at depths of 30 m or more below the surface; flow in the interbasin areas separating the basins is generally less than 5 m deep. The limestone underlying the region is thin bedded with shale partings and argillaceous units. Within ground water basins, sinkhole drains and other conduits have breached the shales, and descend (almost vertically) to a level determined by equilibrium flow in the larger conduits. The general location and flow directions in the ground water basins are probably determined by potentiometric gradient prior to conduit development. GRA

N83-20347# Geological Survey, Harrisburg, Pa. Water Resources Div.

WATER RESOURCES DATA, PENNSYLVANIA, WATER YEAR 1981. VOLUME 3: OHIO RIVER AND ST. LAWRENCE RIVER BASINS Annual Report, 1 Oct. 1980 - 30 Sep. 1981

1982 324 p refs

(PB83-107128; USGS/WRD/HD-81/029-Vol-3; USGS-WDR-PA-81-3-Vol-3) Avail: NTIS HC A14/MF A01 CSCL 08H

Water resources data for the 1981 water year for Pennsylvania consist of records of discharge and water quality of streams; elevation and contents of lakes and reservoirs; and water levels of ground-water wells. Records for water discharge at 86 gaging stations; elevations and contents at 3 lakes and reservoirs; water quality at 35 gaging stations; and water levels at 20 observation wells are given. Also included are data for 11 crest-stage, 7 low-flow and 322 water-quality partial-record stations. Locations of these sites are shown on figures 4 through 7. Additional water data were collected at various sites not involved in the systematic data-collection program and are published as miscellaneous measurements and analyses. Author (GRA)

N83-20348# Geological Survey, Boise, Idaho. Water Resources Div.

WATER RESOURCES DATA, IDAHO, WATER YEAR 1981. VOLUME 2: UPPER COLUMBIA RIVER BASIN AND SNAKE RIVER BASIN BELOW KING HILL Annual Report, 1 Oct. 1980 - 30 Sep. 1981

Jun. 1982 392 p

(PB83-107037; USGS/WRD/HD-81-048-Vol-2; USGS/WRD/ID-81-2-Vol-2) Avail: NTIS HC A17/MF A01 CSCL 08H

Water resources data for the 1981 water year for Idaho consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. Discharge records for 204 gaging stations; stage only records for 2 gaging stations; stage only for 11 lakes and reservoirs; contents only for 16 lakes and reservoirs; water quality for 84 gaging stations, 77 partial-record stations, 138 wells, and 5 precipitation sites; and water levels for 469 observation wells are given. Also included are data for 38 crest-stage partial-record stations. Author (GRA)

N83-20349# Geological Survey, Tacoma, Wash. Water Resources Div.

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1980. VOLUME 1: WESTERN WASHINGTON Annual Report, 1 Oct. 1979 - 30 Sep. 1980

Apr. 1982 504 p refs

(PB83-105734; USGS/WRD/HD-81-016-Vol-1; USGS/WRD/WA-80-1-Vol-1) Avail: NTIS HC A22/MF A01 CSCL 08H

Water Resources data for the 1980 water year for Washington consist of records of stage, discharge and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water wells. Records for water discharge at 233 gaging stations, stage only at 5 gaging stations; stage and contents at 41 lakes and reservoirs; water quality at 39 gaging stations (including 6 lakes and reservoirs) and 100 wells; and water levels at 164 observations wells are given. Author (GRA)

N83-20350# Geological Survey, Iowa City, Iowa. Water Resources Div.

WATER RESOURCES DATA, IOWA, WATER YEAR 1981 Annual Report, 1 Oct. 1980 - 30 Sep. 1981

14 Apr. 1981 268 p

(PB83-105601; USGS/WRD/HD-81/023; USGS-WDR-IA-81-1) Avail: NTIS HC A12/MF A01 CSCL 08H

Water resources data for the 1981 water year for Iowa consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. Discharge records for 119 gaging stations; stage and contents for 7 lakes and reservoirs; water quality for 25 gaging stations; and water levels for 34 observation wells are given. Also included are 124 crest-stage partial-record stations. Author (GRA)

N83-20351# Geological Survey, Columbus, Ohio. Water Resources Div.

WATER RESOURCES DATA FOR OHIO, WATER YEAR 1981. VOLUME 2: ST. LAWRENCE RIVER BASIN STATEWIDE PROJECT DATA

Mar. 1982 344 p refs

(PB83-105528; USGS/WRD/HD-82/026-Vol-2; USGS-WRD-OH-81-2-Vol-2) Avail: NTIS HC A15/MF A01 CSCL 08H

Water resources data for the 1980 water year for Ohio consist of records of stage, discharge, and water quality of streams; stage and contents, and water quality of lakes and reservoirs; and water levels and water quality of groundwater wells. Records for water discharge at 169 gaging stations; stage and contents at 39 lakes and reservoirs; water quality at 53 gaging stations and 59 wells; and water levels at 280 observation wells are given. Also included are data from 81 crest-stage partial-records stations; 120 low-flow partial-record stations, and 331 coal hydrology synoptic sites. Author (GRA)

N83-20352# Geological Survey, Lansing, Mich. Water Resources Div.

WATER RESOURCES DATA FOR MICHIGAN, WATER YEAR 1981 Annual Water-Data Report, 1 Oct. 1980 - 30 Sep. 1981

Jun. 1982 538 p refs

(PB83-102699; USGS-WRD-MI-81-1; USGS/WRD-HD-81-043) Avail: NTIS HC A23/MF A01 CSCL 08H

Water resources data for the 1981 water year for Michigan consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water temperature of ground water. Discharge records for 178 gaging stations; stage only records for 4 gaging stations; stage and contents for 5 lakes and reservoirs; water quality for 45 continuous record stations; and water levels for 53 observation wells are contained. GRA

N83-20353# Geological Survey, Richmond Va. Water Resources Div.
WATER RESOURCES FOR VIRGINIA, WATER YEAR 1981 Annual Water-Data Report, 1 Oct. 1980 - Sep. 1981
May 1982 567 p refs Sponsored in part by State of Virginia
(PB83-103192; USGS-WRD-VA-81-1) Avail: NTIS HC A24/MF A01 CSCL 08H

Water resources data for the 1981 water year for Virginia consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water wells. Records for water discharge at 211 gaging stations; stage only at 1 gaging station; stage and contents at 10 lakes and reservoirs; water quality at 48 gaging stations and 75 wells; and water levels at 57 observation wells are given. Author (GRA)

N83-20354# Geological Survey, Huron, S. Dak. Water Resources Div.
WATER RESOURCES DATA FOR SOUTH DAKOTA, WATER YEAR 1981 Annual Water-Data Report, 1 Oct. 1980 - 30 Sep. 1981
Jul. 1982 367 p refs Sponsored in part by the state of South Dakota
(PB83-102715; USGS-WRD-SD-81-1; USGS/WRD/HD-82/037) Avail: NTIS HC A16/MF A01 CSCL 08H

Water resources data for the 1981 water year for South Dakota consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. Discharge records for 104 gaging stations; stage and contents for 10 lakes and reservoirs; water quality for 20 gaging stations; and water levels for 8 observation wells are given. Author (GRA)

N83-20355# Geological Survey, Tacoma, Wash. Water Resources Div.
WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1980. VOLUME 2: EASTERN WASHINGTON Annual Water-Data Report, 1 Oct. 1979 - 30 Sep. 1980
Apr. 1982 346 p refs Sponsored in part by the state of Washington
(PB83-102707; USGS-WRD-WA-80-2-Vol-2; USGS-WRD-81-017-VOL-2) Avail: NTIS HC A15/MF A01 CSCL 08H

Water Resources data for the 1980 water year for Washington consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water wells. This report in two volumes contains records for water discharge at 233 gaging stations stage only at 5 gaging stations; stage and contents at 41 lakes and reservoirs; and water quality at 39 gaging stations (including 6 lakes and reservoirs) and 100 wells; and water levels at 164 observation wells. GRA

N83-20356# Geological Survey, Lakewood, Colo. Water Resources Div.
WATER RESOURCES DATA, COLORADO, WATER YEAR 1981. VOLUME 2: COLORADO RIVER BASIN ABOVE DOLORES RIVER Annual Report, 1 Oct. 1980 - 30 Sep. 1981
1981 371 p refs
(PB83-105098; USGS/WRD-HD-82-035; USGS/WDR-CO-81-2) Avail: NTIS HC A16/MF A01 CSCL 08H

Water resources data for Colorado for the 1981 water year consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs, and water levels and water quality of wells and springs. Discharge records for about 460 gaging stations, stage and contents of 22 lakes and reservoirs, 4 partial-record low-flow stations, 30 crest-stage partial-record stations, and 50 miscellaneous sites; water quality for 163 gaging stations and 300 miscellaneous sites; and water levels for 55 observation wells are contained. GRA

N83-20357# Iowa Univ., Iowa City. Inst. of Hydraulic Research.
IIHR DISTRIBUTED PARAMETER WATERSHED MODEL
S. C. Jain, S. Kumar, G. Whelan, and T. E. Croley, II Jun. 1982 243 p refs
(Contract DI-14-34-0001-9072)
(PB83-108084; IIHR-244; W83-00269; OWRT-B-064-IA(1); SWRRI-102) Avail: NTIS HC A11/MF A01 CSCL 08H

A model is presented which describes a catchment in fine detail by retaining individual characteristics throughout the watershed, and which includes consideration of overland and channel models of water and sediment flows. Specifically considered is the application of the infiltration model to compute rainfall excess hyetographs, flood modeling, watershed sedimentation modeling, and application to Ralston Creek. Channel routing is performed from node to node via natural channel shapes on the premise that lateral inflows can be adequately represented by the inflows at the nodes. Overland and channel flows are numerically analyzed. GRA

N83-20358# Geological Survey, Raleigh, N. C. Water Resources Div.
WATER RESOURCES DATA FOR NORTH CAROLINA, WATER YEAR 1981 Annual Water-Data Report, 1 Oct. 1980 - 30 Sep. 1981
Mar. 1982 478 p Prepared in cooperation with the North Carolina Dept. of Natural Resources and Community Development, Raleigh
(PB83-103432; USGS/WRD-HD-82-025; USGS-WDR-NC-81-1) Avail: NTIS HC A21/MF A01 CSCL 08H

Water resources data for the 1981 water year for North Carolina consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and ground-water levels. Discharge records for 151 gaging stations; stage and contents for 24 lakes and reservoirs, and stage only for one lake; water quality for 52 gaging stations and 6 miscellaneous sites; and water levels for 61 observation wells are given. Author (GRA)

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N83-20359*# Charles River Associates, Inc., Boston, Mass.
STUDY TO ESTABLISH COST PREDICTIONS FOR THE PRODUCTION OF REDOX CHEMICALS Final Report
Paul R. Ammann, Michael Loreth, and W. W. Harvey Jul. 1982 61 p refs
(Contracts DEN3-251; DE-AI04-80AL-12726)
(NASA-CR-167882; DOE/NASA/0251-1; NAS 1.26:167882) Avail: NTIS HC A04/MF A01 CSCL 10A

The chromium and iron chloride chemicals are significant first costs for NASA Redox energy storage systems. This study was performed to determine the lowest cost at which chromium and iron chlorides could be obtained for a complex of redox energy storage systems. In addition, since the solutions gradually become intermixed during the course of operation of Redox units, it was an objective to evaluate schemes for regeneration of the operating solutions. Three processes were evaluated for the production of chromium and iron chlorides. As a basis for the preliminary plant design and economic evaluation, it was assumed that the plant would produce about 25,000 tons of contained chromium as CrCl3 and an equivalent molar quantity of FeCl2. Preliminary plant designs, including materials and energy balances and sizing of major equipment, were prepared, and capital and operating costs were estimated. Author

N83-20360*# Rockwell International Corp., Pittsburgh, Pa. Satellite Systems Div.
LOW CONCENTRATION RATION SOLAR ARRAY FOR LOW EARTH ORBIT MULTI-100 kW APPLICATION Mid-term Report
S. J. Nalbandian Nov. 1982 146 p refs
(Contract NAS8-34214)
(NASA-CR-170729; NAS 1.26:170729; SSD82-0172) Avail: NTIS HC A07/MF A01 CSCL 10A

An ongoing preliminary design effort directed toward a low-concentration-ratio photovoltaic array system based on 1984 technology and capable of delivering multi-hundred kilowatts (300 kW to 1000 kW range) in low earth orbit is described. The array system consists of two or more array modules each capable of delivering between 80 kW to 172 kW using silicon solar cells or gallium arsenide solar cells respectively. The array module deployed area is 1320 square meters and consists of 4356 pryamidal concentrator elements. The module, when stowed in the Space Shuttle's payload bay, has a stowage volume of a cube with 3.24 meters on a side. The concentrator elements are sized for a geometric concentration ratio (GCR) of six with an aperture area of 0.5 meters x 0.5 meters. The structural analysis and design trades leading to the baseline design are discussed. The configuration, as well as optical, thermal and electrical performance analyses that support the design and overall performance estimates for the array are described. Author

N83-20361*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CRITICAL RESEARCH AND ADVANCED TECHNOLOGY (CRT) SUPPORT PROJECT Summary Report
Edward R. Furman, David N. Anderson, Philip E. Hodge, Carl E. Lowell, Joseph J. Nainiger, and Donald F. Schultz Feb. 1983 58 p refs
(Contract DE-AI01-77ET-10350)
(NASA-TM-83019; E-1455; DOE/NASA/10350-35; NAS 1.15:83019) Avail: NTIS HC A04/MF A01 CSCL 10A

A critical technology base for utility and industrial gas turbines by planning the use of coal-derived fuels was studied. Development tasks were included in the following areas: (1) Combustion - investigate the combustion of coal-derived fuels and methods to minimize the conversion of fuel-bound nitrogen to NOx; (2) materials - understand and minimize hot corrosion; (3) system studies - integrate and focus the technological efforts. A literature survey of coal-derived fuels was completed and a NOx emissions model was developed. Flametube tests of a two-stage (rich-lean) combustor defined optimum equivalence ratios for minimizing NOx emissions. Sector combustor tests demonstrated variable air control to optimize equivalence ratios over a wide load range and steam cooling of the primary zone liner. The catalytic combustion of coal-derived fuels was demonstrated. The combustion of coal-derived gases is very promising. A hot-corrosion life prediction model was formulated and verified with laboratory testing of doped fuels. Fuel additives to control sulfur corrosion were studied. The intermittent application of barium proved effective. Advanced thermal barrier coatings were developed and tested. Coating failure modes were identified and new material formulations and fabrication parameters were specified. System studies in support of the thermal barrier coating development were accomplished. Author

N83-20362*# Delaware Univ., Newark. Dept. of Electrical Engineering.
DESIGN RULES FOR A 100X MAXIMUM EFFICIENCY GaAs CONCENTRATOR SOLAR CELL FOR SPACE APPLICATIONS Final Report
Alan N. Barnett 22 Mar. 1983 15 p refs
(Grant NAG3-321)
(NASA-CR-170005; NAS 1.26:170005) Avail: NTIS HC A02/MF A01 CSCL 10A

The preference of N on P as the preferred structure rather than the common P on N structure, the design of an improved transparency top contact based on the separation of the grid and bus bars, and the identification of gallium phosphide as an improved window layer, replacing the (GaAl) are investigated. Author

N83-20363# RAND Corp., Santa Monica, Calif.
AN ENERGY CRISIS MANAGEMENT SIMULATION FOR THE STATE OF CALIFORNIA
Margaret Ann Thomas Aug. 1982 74 p Proc. of the Energy Crisis Management Workshop, Santa Monica, Calif., 27-29 Jan. 1982 Sponsored by the California State Energy Resources Conservation and Development Commission
(RAND/R-2899-CEC; LC-82-15038; ISBN-0-8330-0437-9) Avail: NTIS HC A04/MF A01

The Rand Corporation hosted an energy crisis management workshop on January 27-29, 1982. The workshop was sponsored by the California Energy Commission and was designed to give participants experience in managing an energy emergency. The vehicle for providing this experience was a gaming exercise that simulated an international energy emergency. The structure of the game used in the workshop and the game results are documented. Author

N83-20364# Committee on Science and Technology (U. S. House).
THE ROLE OF BUSINESS INCENTIVES IN THE DEVELOPMENT OF RENEWABLE ENERGY TECHNOLOGIES
Washington GPO 1982 134 p Hearing before the Subcomm. on Energy Develop. and Appl. of the Comm. on Sci. and Technol., 97th Congr., 2d Sess., 13 Jul. 1982
(GPO-99-651) Avail: Subcommittee on Energy Development and Applications

A 15% business energy tax credit for renewable energy systems is examined. Witnesses from photovoltaics, solar thermal, wind, and OTEC industries testified about the importance of the credits to their ability to develop and demonstrate new technologies. Author

N83-20365# Committee on Science and Technology (U. S. House).
THE NATURAL GAS OPTION. NEW RESOURCES AND NEW TECHNOLOGIES
Washington GPO 1982 233 p Hearing before the Subcomm. on Energy Develop. and Appl. of the Comm. on Sci. and Technol., 97th Congr., 2d Sess., 30 Jul. 1982
(GPO-99-979) Avail: Subcommittee on Energy Development and Applications

Unconventional and traditional resources of natural gas, the technological needs of the industry to develop these resources, and the impact of price flutuations on their production plans and on the future growth of the natural gas industry are discussed. The advantages and disadvantages of accelerated natural gas and oil production are also discussed. Author

N83-20366# Committee on Science and Technology (U. S. House).
COAL RESEARCH
Washington GPO 1982 448 p refs Hearings before the Subcomm. on Energy Develop. and Appl. of the Comm. on Sci. and Technol., 97th Congr., 2d Sess., 18 May, 21 Jun., 23 Aug. and 16 Sep. 1982
(GPO-99-879) Avail. Subcommittee on Energy Development and Applications

Coal research is discussed. National scientific skills available to coal research are inventoried, achievements are assessed, and the Federal role is determined. Author

N83-20367# Committee on Science and Technology (U. S. House).
RENEWABLE ENERGY IN THE EIGHTIES: NEEDS FOR FURTHER R AND D
Washington GPO 1982 619 p refs Hearings before the Subcomm. on Energy Develop. and Appl. of the Comm. on Sci. and Technol., 97th Congr., 2d Sess., 28 May, 28 Jul. 1982
(GPO-99-663) Avail: Subcommittee on Energy Development and Applications

Renewable energy research, development, demonstration, solar energy technology research needs, and solar thermal systems research and development needs are discussed. Author

N83-20368# Committee on Science and Technology (U. S. House).
ROBOTICS
Washington GPO 1983 453 p refs Hearings before the Subcomm. on Invest. and Oversight of the Comm. on Sci. and Technol., 97th Congr., 2d Sess., 2, 23 Jun. 1982 .
(GPO-99-916) Avail: Subcommittee on Investigations and Oversight

The current state of the art of robot technology, both internationally and in the United States is assessed. Current areas of research are examined. Author

N83-20369# Committee on Science and Technology (U. S. House).
US SOLAR AND CONSERVATION TECHNOLOGIES IN INTERNATIONAL MARKETS
Washington GPO 1982 419 p Hearings before the Subcomm. on Energy Develop. and Appl. and the Subcomm. on Invest. and Oversight of the Comm. on Sci. and Technol., 97th Congr., 2d Sess., 3, 17, 21 Jun. 1982
(GPO-99-627) Avail: Subcommittee on Energy Development and Applications

The effect of cutbacks in Federal RD&D spending on conservation and solar technologies proposed in terms of a possible competitive disadvantage for American manufacturers. Author

N83-20370# Committee on Science and Technology (U. S. House).
BUILDING ENERGY RESEARCH
Washington GPO 1982 211 p Hearing before the Subcomm. on Energy Develop. and Appl. of he Comm. on Sci. and Technol., 97th Congr., 2d Sess., 22 Jul. 1982
(GPO-11-221) Avail: Subcommittee on Energy Development and Applications

A building energy research program initiative is considered. Author

N83-20371# Committee on Science and Technology (U. S. House).
ENERGY-EFFICIENT TECHNOLOGY: ADVANCING US COMPETITIVENESS AND PRODUCTIVITY.
Langdon Crane, ed. and Fred Sissine, ed. Washington GPO 1982 189 p refs Presented to the Comm. on Sci. and Technol., 97th Congr., 2d Sess., Feb. 1982 Proc. of a seminar held in Washington. D.C., 11 Feb. 1982 Prepared by the Library of Congr., Congr. Res. Serv.
(GPO-98-637) Avail: US Capitol, House Document Room

Industrial process efficiency, energy conversion equipment, and policies and program are discussed. Author

N83-20372# Committee on Science and Technology (U. S. House).
FISCAL YEAR 1983 DEPARTMENT OF ENERGY BUDGET REVIEW. MAGNETIC FUSION ENERGY. VOLUME 5
Washington GPO 1982 564 p Hearings before the Subcomm. on Energy Res. and Prod. of the Comm. on Sci. and Technol., 97th Congr., 2d Sess., 23, 24 Mar. 1982
(GPO-98-550) Avail: Subcommittee on Energy Research and Production

The DOE magnetic fusion energy program is considered. Budget testimony is provided. Author

N83-20373# Committee on Science and Technology (U. S. House).
AMERICAN TECHNOLOGY TRANSFER AND SOVIET ENERGY PLANNING
Washington GPO 1982 229 p refs Hearings before the Subcomm. on Invest. and Oversight of the Comm. on Sci. and Technol., 97th Congr., 1st and 2d Sess. 10 Dec. 1981 and 9 Feb. 1982
(GPO-97-481) Avail: Subcommittee on Investigations and Oversight

Concerning Soviet oil and gas, it is proposed that projection of Soviet production is difficult due to lack of precise information. Gas not oil is considered the most crucial sector of Soviet energy expansion. Author

N83-20374*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SCREEN PRINTED INTERDIGITATED BACK CONTACT SOLAR CELL Patent Application
C. R. Baraona, George A. Mazaris, and An-Ti Chai, inventors (to NASA) Filed 10 Feb. 1983 8 p
(NASA-Case-LEW-13414-1; US-Patent-Appl-SN-465364) Avail: NTIS HC A02/MF A01 CSCL 10A

Interdigitated back contact solar cells were made by screen printing dopant materials onto the back surface of a semiconductor substrate in a pair of interdigitated patterns. These dopant materials were then diffused into the substrate to form junctions having configurations corresponding to these patterns. Contacts having configurations which match the patterns were then applied over the junctions. NASA

N83-20375# Arizona State Univ., Tempe.
ANALYTICAL AND EXPERIMENTAL INVESTIGATIONS OF SODIUM HEAT PIPES AND THERMAL ENERGY STORAGE SYSTEMS Final Report, Oct. 1980 - Sep. 1981
Dean Jacobson Wright-Patterson AFB, Ohio AFWAL Jan. 1982 213 p refs
(Contract F33615-77-C-2059; AF Proj. 2308)
(AD-A122093; AFWAL-TR-81-2112) Avail: NTIS HC A10/MF A01 CSCL 13/1

Eight work elements for FY 1981 are reported on. A brief evaluation of the limits of arterial heat pipes is presented followed by the post life examination of two Inconel 600, sodium heat pipes which failed by pin hole corrosion through the evaporator. Nearly 12,000 hours of operation was sustained by one of the heat pipes prior to failure. A parametric test station for a thermal train including a 15-foot Inconel 617-sodium heat. A secondary sodium heat pipe with integral LiF thermal energy storage capsules and a sodium thermal transfer joint is discussed. A series of fifteen 18-in. long by 0.5 in. diameter Inconel 617, sodium heat pipes are being prepared for parametric and life tests. A 12-in. long, 1-in. diameter Inconel 617 container filled with the thermal energy storage salt 64LiF-30 MgF2-6KF was tested to determine latent heat of fusion (782 J/gm), melting point (710 C), freezing point (671 C) and diffusivity (0.00799 sq cm/sec) of the salt. The post life test results of a series of nine salt-Inconel 600 capsules, including LiF-MgF2, LiF-MgF2 -KF, and LiF-MgF2 NaF are presented. A 321 stainless steel, sodium heat pipe containing three LiF thermal energy storage units has a total of over 10,700 hours of operation and 3426 cycles of life testing. GRA

N83-20376# Army Electronics Research and Development Command, Fort Monmouth, N. J.
HIGH-CYCLE-LIFE, HIGH-ENERGY-DENSITY NICKEL-ZINC BATTERIES
O. C. Wagner Feb. 1982 102 p refs
(Contract DE-AI02-80CH-10064)
(DE82-012896; DOE/CH-10064/5; Rept-5) Avail: NTIS HC A06/MF A01

The ERADCOM nickel-zinc program, resulted in the development of 5 ampere-hour nickel-zinc cells that maintained 79% to 86% of initial capacity after 650 cycles on the C/3 80% DOD cycling regime. One cell is still delivering 70% of initial capacity after 880 cycles. This achievement is primarily due to the employment of an interrupted current (IC) charging mode on every cycle, the optimum frequency being 5 to 8 Hertz at a rest-to-pulse-ratio of 3/1, with charge control being by means of a GRL pressure switch attached to each cell at a cutoff pressure of 8 psig, and venting means at 10 psig. Design and performance characteristics of the battery are reported. DOE

N83-20377# Oak Ridge National Lab., Tenn. Research and Renewables Research Section.
ANNUAL CYCLE ENERGY SYSTEM PERFORMANCE AND NATIONAL ECONOMIC COMPARISONS WITH COMPETITIVE RESIDENTIAL HVAC SYSTEMS
V. D. Baxter 1982 16 p refs Presented at the Semiannual Meeting of the American Society of Heating, Refrigerating, and Air Conditioning Engineers, Houston, Tex., 24 Jan. 1982
(Contract W-7405-eng-26)
(DE82-010188; CONF-820112-6) Avail: NTIS HC A02/MF A01

The results of three years of experience with the Annual Cycle Energy System (ACES) and conventional systems in two identical houses, the ACES house (using an ACES for heating, cooling, and water heating) and the control house (using conventional systems). The houses, located in a test complex on the University of Tennessee campus at Knoxville, Tennessee were unoccupied during the tests. Internal loads for a family of four were simulated by appliances and hot water used at the rate of 265 L/d (70 gal/d). The test period extended from November 1, 1977 through September 15, 1980. Additionally the results of an analytical study comparing the ACES performance and economics with that of several conventional heating, ventilating, and air conditioning (HVAC) and water heating systems are summarized. DOE

N83-20378# Ministerio das Minas e Energia, Brasilia (Brazil).
BRAZILIAN ENERGY MODEL
May 1981 91 p In SPANISH
(DE82-902461; NP-2902461) Avail: NTIS HC A05/MF A01

A summary of the energy situation in Brazil is presented. Energy consumption rates, reserves of primary energy, and the basic needs and strategies for meeting energy self sufficiency are discussed. Conserving energy, increasing petroleum production, and utilizing other domestic energy products and petroleum by-products are discussed. Specific programs are described for the development and use of alcohol fuels, wood and charcoal, coal, schist, solar and geothermal energy, power from the sea, fresh biomass, special batteries, hydrogen, vegetable oil, and electric energy from water power, nuclear, and coal. Details of the energy model for 1985 are given. Attention is also given to the energy demands and the structure of global energy from 1975 to 1985. DOE

N83-20379# Oak Ridge National Lab., Tenn.
DISTRICT HEATING AND MORE-EFFICIENT BUILDINGS
Gerald D. Pine, Michael A. Karnitz, Martin A. Broders, and William R. Mixon 1981 8 p Presented at the Energy in the Man-Built Environ.: The Next Decade Spec. Conf., Vail, Colo., 3 Aug. 1981
(Contract W-7405-eng-26)
(DE81-025437; CONF-810808-10) Avail: NTIS HC A02/MF A01

The fuel consumed to supply the thermal demands in buildings can be reduced by improving the thermal integrity of buildings or by relying on more efficient methods of converting the fuel energy into heat. It is shown that one conversion option, district heating with cogeneration, requires about the same amount of capital investment per unit of energy saved as required by single-building conservation measures. District heating also offers additional benefits from substitution of more plentiful fuels for oil and gas and improved local air quality in a community. District heating and building efficiency improvements are not mutually exclusive, however, and this analysis indicates that the life cycle cost is minimized when buildings are improved and a district heating system is built. DOE

N83-20380# Rocket Research Corp., Redmond, Wash.
SULFURIC ACID/WATER CHEMICAL HEAT PUMP/CHEMICAL ENERGY STORAGE, PHASES 1 AND 2, PHASES 3 AND 4 Final Report, Oct. 1979 - Jan. 1982
Apr. 1982 281 p
(Contract DE-AC02-76CH-00016)
(DE83-001255; BNL-51540) Avail: NTIS HC A13/MF A01

The sulfuric acid/water chemical heat pump/chemical energy storage (CHP/CES) concept was expanded to include previously unexplored applications, the most notable of which is the industrial chemical heat pump. It is shown that the CHP/CES application has the greatest near term commercialization potential in the form of a temperature amplification system. Another configuration, the HVAC system with or without diurnal storage was selected for further study. A verification test unit was designed which is capable of demonstrating operation as an ICHP as well as an HVAC system. The VTU was fabricated and tested with a nominal power rating of 150,000 Btu/hr. Testing of the unit operational performance in the industrial waste heat upgrade mode is tested. DOE

N83-20381# Solar Business Office, Sacramento, Calif. Business and Transportation Agency.
SOLAR FOR INDUSTRY Final Report
15 Apr. 1980 52 p refs Presented at a seminar on Solar for Ind., Los Angeles, 22 Feb. 1980, and at San Francisco, 21 Mar. 1980
(Contract DE-FG03-79CS-30284)
(DE83-003301; DOE/CS-30284/T2) Avail: NTIS HC A04/MF A01

Two seminars on Solar for Industry were held. An agenda, feedback, lists of attendees and invitees, and a published article are provided. Also provided is a conference packet, including a questionnaire and original materials used. The conferences are evaluated and follow-up efforts are listed. DOE

N83-20382# Massachusetts Inst. of Tech., Cambridge.
CHALCOGENIDE-GLASS SOLAR CELLS Quarterly Technical Report, 1 Jan. - 31 Mar. 1980
David Adler and John S. Haggerty 1980 30 p
(Contract DE-AC03-79ET-23043)
(DE82-021243; DOE/ET-23043/T2; QTR-2) Avail: NTIS HC A03/MF A01

Several disadvantages of chalcogenide glasses for solar cell applications are studied to determine if they can be overcome by chemical modification. These problems include a pinned Fermi energy, low carrier lifetime, and the presence of geminate recombination for photon frequencies just above the optical bandgap which reduces the overall quantum efficiency. Emphasis is on the selenium-tellurium system. The tasks reported were: to try to overcome the transient effects by stabilizing the glass with a modifier such as arsenic, to reactively sputter the glass in hydrogen/argon mixtures to ascertain whether the introduction of hydrogen would serve to reduce the defect density, and to cosputter the glass with lithium in an attempt to unpin the Fermi energy of the glass and obtain a low resistance back contact for solar cells. Stabilization was accomplished with only 1% arsenic. It is found that hydrogenation increases the resistance somewhate and leads to non-ohmic behavior at a lower applied field; however the photoconductivity and the spectral response of the photocurrent are degraded. DOE

N83-20383# Ames Lab., Iowa.
FOSSIL-ENERGY Quarterly Report, 1 Oct. - 31 Dec. 1981
J. E. Benson, R. A. Jacobson, Donald L. Biggs, D. Birlingmair, R. Fisher, W. E. Straszheim, Clifford G. Venier, and Thomas G. Squires May 1982 34 p
(Contract W-7405-eng-82)
(DE83-003817; IS-4801) Avail: NTIS HC A03/MF A01

Objectives and progress in the areas of the fossil energy program are reported. The following subjects were studied: the mineral content of coal and the development of an online monitoring instrument; ashing properties of coal blends; coal preparation and testing; coal microcharacterization (trace elements); and chemical evaluation of the gravimelt process. DOE

N83-20384# Arizona Public Service Co., Phoenix.
AIRPORT SOLAR PHOTOVOLTAIC CONCENTRATOR Project Status Report, 1 Jul. - 31 Oct. 1982
1982 9 p
(Contract DE-AC04-80ET-20624)
(DE83-003137; DOE/ET-20624/T1; ASPCP-111-1) Avail: NTIS HC A02/MF A01

The operation and evaluation at the Phoenix Sky Harbor International Airport Van 80-array photovoltaic power supply rated at 225 kW is reported. Problems with acquiring array performance data due to a malfunction of the tester are reported. System availability and energy production and usage data are listed, as is the distribution of system downtime. System operation and maintenance efforts are reported. The data acquisition system data are compared to other similar data for correlation. System performance is reported to be good, and about 320,000 kWh are expected for the first year's operation. DOE

N83-20385# Curtiss-Wright Corp., Wood-Ridge, N.J. Power Systems Div.
DESIGN, CONSTRUCTION, OPERATION AND EVALUATION OF A PROTOTYPE CULM COMBUSTION BOILER/HEATER UNIT Monthly Project Status Report, 1 - 31 Dec. 1981
Jan. 1982 14 p
(Contract DE-AC21-78ET-12307)
(DE82-007655; CW-WR-036.55) Avail: NTIS HC A02/MF A01 CSCL 10B

Progress in the development and testing of a prototype culm combustion boiler is reported. The engineering design, component testing, and environmental assessment of the culm-fuel fluidized-bed combustor were completed previously. During December 1981 the following items were accomplished: the exhaust gas visual emission/opacity monitoring system, procured from Datatest in accordance with Specification E-90140, Rev. A, was delivered to the site, and should be installed during the next reporting period. The magnetic tape storage facility as an addition to the AFBB process computer was ordered with a scheduled delivery date of 1/25/82. The prototype boiler construction, installation, checkout, and acceptance, and documentation is completed. Start-up and operation has been scheduled. DOE

N83-20386# Department of Energy, Washington, D. C.
MATERIALS FOR COAL CONVERSION AND UTILIZATION
1981 575 p refs 6th Ann. Conf. held in Gaithersburg, Md., 13-16 Oct. 1981; sponsored by DOE, EPRI, Gas Research Inst., and NBS
(DE82-013244; CONF-811061) Avail: NTIS HC A24/MF A01

The Sixth Annual Conference on Materials for Coal Conversion and Utilization was held October 13-15, 1981 at the National Bureau of Standards Gaithersburg, Maryland. It was sponsored by the US Department of Energy, the Electric Power Research Institute, the Gas Research Institute and the National Bureau of Standards. Fifty-eight papers from the proceedings have been entered individually into EDB and ERA; four papers have been entered previously from other sources. (LTN) DOE

N83-20387# Sandia Labs., Albuquerque, N. Mex.
PHOTOVOLTAIC-CONCENTRATOR TECHNOLOGY IN THE USA
E. C. Boes and M. W. Edenburn 1982 6 p refs Presented at 4th Photovoltaic Solar Energy Conf., Stresa, Italy, 10 May 1982
(Contract DE-AC04-76DP-00789)
(DE82-016399; SAND-82-1154C; CONF-820555-4) Avail: NTIS HC A02/MF A01

One of the alternate electrical energy technologies that has progressed most rapidly over the past several years is photovoltaic concentrator technology. In the US, with funding of approximately $40 million over the past 7 years, this solar electric technology has been transferred from the conceptual stage to the point where several promising designs have been fabricated and tested. The experience of concentrator research and development thus far strongly supports the initial hope that it could be a practical alternative to flat plate photovoltaics. PV concentrators are far more efficient than flat plate PV modules. Designing PV concentrators with 20 year lifetimes appears feasible. Totally installed PV concentrator array costs are projected to reach $1 to $2 per peak watt. Fresnel lens concentrators using planar junction Si cells have already achieved measured annual average efficiencies of 13 to 14%, and well understood modifications will increase this to the 15 to 16% range. More advanced module designs have been measured at as high as 20%. DOE

N83-20388# Sandia Labs., Albuquerque, N. Mex.
DESIGN, TESTING, AND ECONOMICS OF A 430 W SUB P PHOTOVOLTAIC CONCENTRATOR ARRAY FOR NON GRID-CONNECTED APPLICATIONS
A. Maish, M. Rios, Jr., and H. Togami 1982 6 p refs Presented at Am. Section of the Intern. Solar Energy Soc. Conf., Houston, Tex., 1 Jun. 1982
(Contract DE-AC04-76DP-00789)
(DE82-014687; SAND-82-0957C; CONF-820629-9) Avail: NTIS HC A02/MF A01

A stand-alone 430 W/sub p/ photovoltaic (PV) concentrating system for low power, non grid-connected applications has been designed, fabricated, and tested at Sandia National Laboratories. The array consists of four passively cooled Fresnel lens concentrating modules on a newly developed polar axis tracking structure. Two axis tracking is provided using a self powered clock drive unit mounted on a single post foundation. Test results of tracking accuracy, array output power, parasitic power, performance in winds and array reliability are discussed. using a range of estimated production costs for small production volumes, the life-cycle energy costs have been calculated and compared to the equivalent energy costs of a 3 kW diesel electric generator set and of an equivalent flat panel PV system. DOE

N83-20389# Arkansas Univ., Fayetteville.
ANALYSIS OF TEMPERATURE DATA FROM MARTIN MARIETTA SOLAR PHOTOVOLTAIC ARRAY
F. K. Deaver Feb. 1982 25 p refs
(Contract DE-AC04-76DP-00789)
(DE82-014258; SAND-81-7177) Avail: NTIS HC A02/MF A01

Solar photovoltaic cells in a concentrating array absorb thermal energy which must be removed to maintain the cells at an optimum operating temperature. One method of removing the heat is by mounting the cells on finned aluminum heat exchangers. In order to model the performance of such a heat exchange, an estimate of the overall heat transfer coefficient between the finned surface and the surroundings is needed. This coefficient is dependent on wind speed, wind direction, heat exchanger design, orientation of the array, and other parameters. Data for several such heat exchangers on a Martin Marietta concentrating photovoltaic array were obtained. A transient analytical model of the heat exchanger was applied to the experimental data from three different modules. Overall coefficients of heat transfer from the exchanger were calculated and correlations of these coefficients with wind speed and direction were attempted. DOE

N83-20390# Varian Associates, Palo Alto, Calif. Solid State Lab.
ACCELERATED AGING OF GaAs CONCENTRATOR SOLAR CELLS
P. E. Gregory Apr. 1982 147 p refs
(Contract DE-AC04-76DP-00789)
(DE82-016658; SAND-81-7112) Avail: NTIS HC A07/MF A01

An accelerated aging study of AlGaAs/GaAs solar cells was completed. The purpose was to identify the possible degradation mechanisms of AlGaAs/GaAs solar cells in terrestrial applications. Thermal storage tests and accelerated AlGaAs corrosion studies were performed to provide an experimental basis for a statistical analysis of the estimated lifetime. Results of this study suggest that a properly designed and fabricated AlGaAs/GaAs solar cell can be mechanically rugged and environmentally stable with projected lifetimes exceeding 100 years. DOE

N83-20391# Boeing Computer Services, Inc., Seattle, Wash.
INTERMEDIATE PHOTOVOLTAIC SYSTEM APPLICATION EXPERIMENT OPERATIONAL PERFORMANCE REPORT. VOLUME 6: BEVERLY HIGH SCHOOL, BEVERLY, MASS. Monthly Report
Mar. 1982 26 p
(Contract DE-AC04-76DP-00789)
(DE82-014710; SAND-81-7088-6) Avail: NTIS HC A03/MF A01

Performance data are given for the month of February, 1982 for a photovoltaic power supply at a Massachusetts high school. Data given include: monthly and daily electrical energy yield; monthly and daily insolation; monthly and daily array efficiency; energy production as a function of power level, voltage, cell temperature, and hour of day; insolation as a function of hour of the day; input, output and efficiency for each of two power conditioning units and for the total power conditioning system; energy supplied to the load by the photovoltaic system and by the grid; photovoltaic system efficiency; dollar value of the energy supplied by the photovoltaic system; capacity factor; daily photovol-

taic energy to load; daily system availability and hours of daylight; heating and cooling degree days; hourly cell temperature, ambient temperature, wind speed, and insolation; average monthly wind speed; wind direction distribution; and daily data acquisition mode and recording interval plot. DOE

N83-20392# Bechtel Corp., San Francisco, Calif. Research and Engineering Operation.
PHOTOVOLTAIC SUBSYSTEM OPTIMIZATION AND DESIGN TRADEOFF STUDY Final Report
W. J. Stolte Mar. 1982 430 p refs
(Contract DE-AC04-76DP-00789)
(DE82-013393; SAND-81-7013) Avail: NTIS HC A19/MF A01

Tradeoffs and subsystem choices are examined in photovoltaic array subfield design, power conditioning sizing and selection, roof and ground mounted structure installation, energy loss, operating voltage, power conditioning cost, and subfield size. Line and self-commutated power conditioning options are analyzed to determine the most cost effective technology in the megawatt power range. Methods for reducing field installation of flat panels and roof mounting of intermediate load centers are discussed, including the cost of retrofit installations. DOE

N83-20393# Sandia Labs., Albuquerque, N. Mex.
PHOTOVOLTAIC RETROFIT FEASIBILITY IN THE UNITED STATES
J. L. Jackson 1982 10 p refs Presented at the 4th Photovoltaic Solar Energy Conf., Stressa, Italy, 10 May 1982
(Contract DE-AC04-76DP-00789)
(DE82-014508; SAND-81-2081C; CONF-820555-1) Avail: NTIS HC A02/MF A01

Residential and commercial retrofits may represent a significant US national market for photovoltaic (PV) systems. Techniques for estimating this market are estimated and conclusions about physical market size are presented. Possible PV retrofitting techniques for residential and commercial structures are discussed. DOE

N83-20394# General Electric Co., Philadelphia, Pa. General Electric Energy Systems and Technology Div.
DESIGN OF A PHOTOVOLTAIC SYSTEM FOR A SOUTHEAST ALL-ELECTRIC RESIDENCE
E. M. Mehalick, G. F. Tully, J. Johnson, N. Truncellito, R. Schaeffer, and J. Parker Jan. 1982 156 p refs Prepared in cooperation with Sandia National Lab., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(DE82-009349; SAND-80-7172) Avail: NTIS HC A08/MF A01

A photovoltaic system was developed and integrated into a single-story residence suitable for the Southeast region of the country. The design addresses an integral mounted array which displaces conventional roof sheathing, roofing felt and shingles. The array has a rated power output of 5.6 kW and covers 86 sq.m. of roof area. A 6 kW utility-tied inverter is used in the power conversion subsystem, representative of a lower cost version, currently available hardware. The system provides feedback of excess energy to the utility, which is the most promising approach for grid-connected systems in the mid-1980's. The complete system and house design are described, including all the pertinent installation and construction drawings. Specific performance results are presented for the Miami, Florida, and Charleston, SC, regions. DOE

N83-20395# Battelle Columbus Labs., Ohio.
THE UTILIZATION OF EMERGENT AQUATIC PLANTS FOR BIOMASS-ENERGY-SYSTEMS DEVELOMENT
S. Kresovich, C. K. Wagner, D. A. Scantland, S. S. Groet, and W. T. Lawhon Feb. 1982 113 p refs Prepared in cooperation with Midwest Research Inst., Golden, Colo.
(Contract DE-AC02-77CH-00178)
(DE82-009174; SERI/TR-98281-03) Avail: NTIS HC A06/MF A01

A review was conducted of the available literature pertaining to the following aspects of emergent aquatic biomass: identification of prospective emergent plant species for management; evaluation of prospects for genetic manipulation; evaluation of biological and environmental tolerances; examination of current production technologies; determination of availability of seeds and/or other propagules, and projections for probable end-uses and products. Species identified as potential candidates for production in biomass systems include Arundo donax, Cyperus papyrus, Phragmites communis, Saccharum spontaneum, Spartina alterniflora, and Typha latifolia. If these species are to be viable candidates in biomass systems, a number of research areas must be further investigated. Points such as development of baseline yield data for managed systems, harvesting conceptualization, genetic (crop) improvement, and identification of secondary plant products require refinement. DOE

N83-20396# General Electric Co., Philadelphia, Pa. Energy Systems and Technology Div.
INITIAL DETAILED DESIGNS FOR INTERMEDIATE PHOTOVOLTAIC SYSTEMS: WAREHOUSE
J. Herz and G. O'Brien Feb. 1982 221 p refs
(Contract DE-AC04-76DP-00789)
(DE82-014534; SAND-81-7189) Avail: NTIS HC A10/MF A01

This initial design for a 30 kW ground mounted, 2-axis tracking concentrator is analyzed for performance and economics. A drawing set, specifications, and installation details are included for procurement and construction bids. DOE

N83-20397# Battelle Columbus Labs., Ohio.
DESIGN AND MARKET STUDY OF PHOTOVOLTAIC SYSTEMS FOR COMMERCIAL BUILDING AND APPLICATIONS. VOLUME 3: APPENDICES
G. T. Noel, J. R. Hagely, and J. H. Broehl Mar. 1982 219 p refs Prepared in cooperation with Sandia National Lab., Albuquerque, N. Mex.
(DE82-016729; SAND-81-7179/3-App-V0l-3) Avail: NTIS HC A10/MF A01

Details of the methodologies and analyses used in developing the results of the design and market study are given. They include: definition of commercial and institutional buildings in terms of the standard industrial classification code; distribution of roof area by building type and region; building characteristics of roof area by building and region; building characteristics survey forms; list of individuals and firms participating in building characteristics survey, by region; selected building characteristics and level of retrofit difficulty; modular design for low-cost flat-panel photovoltaic array fields; life-cycle cost and financial analyses; portions of California and Western Texas included in the Southwest Region market assessments; photovoltaic module specification; and an example photovoltaic applications systems analysis printout. DOE

N83-20398# Advanced Technology, Inc., McLean, Va.
PHOTOVOLTAIC OFF-FARM AGRICULTURAL APPLICATIONS. VOLUME 1: EXECUTIVE SUMMARY Final Report
W. F. Adolfson Feb. 1982 49 p refs Prepared in cooperation with Sandia National Lab., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(DE82-008487; SAND-81-7175/1-Vol-1) Avail: NTIS HC A03/MF A01

The major off farm agricultural applications and photovoltaic system options available for supplying electricity and low temperature heat required by these industries are highlighted. The off farm agricultural industry, which includes food processing, agricultural chemicals, tobacco and alcohol fuels, consumes about 2 percent of the United States energy supply for direct heat and mechanical power. Photovoltaic energy systems can cut energy costs in many of these industrial applications, although early market penetration may be hampered by certain market barriers. DOE

N83-20399# CACI, Inc. - Federal, Arlington, Va.
TRANSPORTATION NETWORK MODELS FOR ENERGY SUPPLY ANALYSIS. VOLUME 1: EXECUTIVE SUMMARY Final Report
W. H. Baxter, M. S. Bronzini, D. R. Limaye, and D. M. Sherman Mar. 1982 57 p refs Sponsored by Electric Power Research Inst.

(EPRI Proj. 1219-3)
(DE82-903077; EPRI-EA-2324-Vol-1) Avail: NTIS HC A04/MF A01

Future coal transportation costs and capacities are examined within a multicommodity framework by employing a national multimodal transportation network model. The model was used to forecast energy transportation costs and to determine the impact of technology and network structure on energy transport supply. The hierarchical structure of the network model includes detailed models of individual freight operations to produce estimates of node and link delay, energy use, and cost for use in the larger network model. The model was used to route origin-destination flows through the network using a minimum path algorithm with additional features such as commodity-specific costs and an equilibrium flow algorithm. A separate railroad routing model was used which has a path selection algorithm that considers rail line ownership as a path choice determinant. DOE

N83-20400# CACI, Inc. - Federal, Arlington, Va.
TRANSPORTATION NETWORK MODELS FOR ENERGY SUPPLY ANALYSIS. VOLUME 3: TRANSPORTATION NETWORK MODEL USER'S GUIDE AND DOCUMENTATION Final Report
W. H. Baxter, M. S. Bronzini, T. C. Hogh, D. R. Limaye, and D. M. Sherman Mar. 1982 150 p Sponsored by Electric Power Research Inst. 3 Vol.
(EPRI Proj. 1219-3)
(DE82-903079; EPRI-EA-2324-Vol-3) Avail: NTIS HC A07/MF A01

The transportation network model for energy supply analysis is given. Complete model documentation is provided including discussions of program logic, input and output and program use. An overview is included. DOE

N83-20401# Wisconsin Univ., Madison. Solar Energy Lab.
SIMULATION AND DESIGN OF PASSIVE PROCESSES Progress Report, 15 Aug. 1981 - 15 Feb. 1982
26 Feb. 1982 40 p refs
(Contract DE-FG02-81CS-30634)
(DE82-016647; DOE/CS-30634/1) Avail: NTIS HC A03/MF A01

Two major parts of the research reported concern: (1) modeling and design of passive processes, and (2) study of meteorological data to make it useful in evaluating and designing passive processes. Results of the first two quarters of this work include: development and exercise of a sunspace model, and conduct of a first sensitivity study of sunspace design factors; development of a subroutine for calculating effects of ground coupling on performance of basements, earth sheltered buildings and buried tanks; publication of preprocessed meteorological data useful in calculation of passive heating performance by anti theta methods; and development of correlations for degree days for various base temperatures and times of day from monthly average temperatures and solar radiation. DOE

N83-20402# Burt, Hill, Kosar, Rittleman and Associates, Washington, D.C.
PERFORMANCE EVALUATION MANUAL FOR SUBMETERED DATA COLLECTION
Jan. 1982 160 p
(Contract DE-AC02-81CS-30632)
(DE82-011223; DOE/CS-30632/3) Avail: NTIS HC A08/MF A01

Forms and procedures are given and explained for reporting performance data including: auxiliary energy used for space heating and cooling and domestic hot water, energy used for lighting and miscellaneous applications, environmental control set points for heating, cooling, and economizer operation, site weather data, and fuel costs. Three forms are proposed. The first, for one time measurements, consists primarily of the architects' assumptions regarding building use, estimates of anticipated performance, and performance specifications of installed equipment. The second form is used to collect data weekly, and is designed to organize information for preparing the monthly report. The third form, the monthly report, summarizes the data collected throughout the month and compares these data with those predicted at the start of the program. Tables specifying the thermal and occupant data measurements to be collected and analyzed are presented along with explanatory notes for each. DOE

N83-20403# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
PERFORMANCE AND STABILITY OF THE MIST-LIFT PROCESS FOR OPEN-CYCLE OTEC
R. L. Davenport Feb. 1982 128 p refs
(Contract DE-AC02-77CH-00178)
(DE82-010881; SERI/TR-252-1422) Avail: NTIS HC A07/MF A01

In the mist flow proposal for open-cycle ocean thermal energy conversion (OTEC), the thermal energy of the warm water is converted into gravitational potential energy causing the water to flow vertically upward as a low-pressure two-phase flow of small droplets in water vapor. The gravitational energy is then converted to electrical energy using a standard hydraulic turbine. The results of SERI's analytical studies of the mist lift process are summarized. Several computer models have been developed: a single-drop-size steady-state (SDS) model: a multiple-drop-size steady-state model including drop coalescence and drop breakup (MDS-B model), and a single-drop-size transient (SDT) model. Results from the multiple-drop-size model indicate that drop growth is rapid up to a mean diameter of about 0.5 mm, and that the drop size spectrum changes little thereafter. Parametric studies performed of the mist lift process is large, and showed the effects of design parameters on performance. DOE

N83-20404# Midwest Research Inst., Golden, Colo. Solar Thermal Engineering Branch.
FLOW INSTABILITY DURING DIRECT STEAM GENERATION IN A LINE-FOCUS SOLAR-COLLECTOR SYSTEM
R. J. Pederson and E. Kenneth May Mar. 1982 31 p refs Sponsored in part by the American Society of Engineering Education
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-012887; SERI/TR-632-1354) Avail: NTIS HC A03/MF A01

The problem of two phase flow instability as applied to the direct generation of steam in a parallel channel, line focus solar system is addressed. Five types of flow instability were identified as being potentially harmful to the operation of the system. The basic mechanism contributing to these instabilities and the criteria used to predict their onset are discussed. The criteria are presented in two generalized maps which can be used for steady as well as transient operation. It is shown that the system considered can be made to operate in a stable manner with only minor modification. DOE

N83-20405# Department of Energy, Washington, D. C. Office of Market Analysis.
INTERNATIONAL ENERGY INDICATORS
Edward Rosoi, Jr., ed. Jan. 1982 31 p
(DE82-012504; DOE/IA-0010/17) Avail: NTIS HC A03/MF A01

Data are presented under the following headings: world crude oil production, OPEC crude oil productive capacity; world crude oil and refined product inventory levels; and oil consumption in the OECD countries. The USSR crude oil production and exports; free world and US nuclear electricity generation; US domestic oil supply; US gross imports of crude oil and products; landed cost of Saudi crude, current and 1974 dollars; US coal trade; US natural gas trade; summary of US merchandise trade; and energy/GNP ratio data are also included. DOE

N83-20406# Argonne National Lab., Ill.
PROCEEDINGS OF THE 1981 SYMPOSIUM ON INSTRUMENTATION AND CONTROL FOR FOSSIL-ENERGY PROCESSES
Jan. 1982 856 p refs Symp. held in San Francisco, Calif., 8-10 Jun. 1981
(Contract W-31-109-eng-38)
(DE82-011999; ANL-81-62; CONF-810607) Avail: NTIS

HC A99/MF A01

Advances in the state of the art in instrumentation and control for fossil energy processes are presented. Temperature monitoring techniques coal analysis techniques, and flow measurement methods are discussed together with process control and sampling and analysis. Environment and industrial hygiene considerations are also addressed. Emphasis is placed on increased importance of instrumentation and control techniques within the synthetic fuels industry. B.G.

N83-20407# Chronar Corp., Princeton, N.J.
SEMICONDUCTING POLYACETYLENE MATERIALS FOR ENERGY-CONVERSION APPLICATIONS Final Report
Zoltan Kiss and B. Weinberger 25 Mar. 1982 20 p refs
(Contract DE-AC02-79ER-10519)
(DE82-012320; DOE/ER-10519/T1) Avail: NTIS
HC A02/MF A01

Well controlled growth of semiconducting polyacetylene films by the Ziegler catalyst method was achieved. Thermal isomerization to the trans-(CH)/sub x/stage has yielded (CH)/sub x/films of p-type doping with an acceptor concentration of 10 to the sixteenth to 10 to the 17th power cu cm. Initial proof of concept experiments were also performed to grow polyacetylene by a plasma assisted process. The band edge of (CH)/sub x/ was measured. The technique consisted of measuring the photoresponse of a reverse biased (CH)/sub x/ solar cell, and studying the cut off in the response. The (CH)/sub x/ films had a band gap in the range of 1.4 to 1.5 eV, in good agreement with the measurement of absorption. A very important result of the successful demonstration of this technique is that very low absorption coefficients can be measured quite easily, yielding invaluable data on band tails in (CH)/sub x/. DOE

N83-20408# Solamat, Inc., East Providence, R.I.
RESEARCH ON APPLICATION OF ARC-PLASMA SPRAYING (APS) Final Report, 18 Sep. 1978 - 28 Feb. 1982
M. C. Narasimhan, J. J. Loferski, B. Roessler, L. B. Freund, J. Piekoszewski, and T. Russell 8 Apr. 1982 165 p refs
(Contract DE-AC02-78ER-04749)
(DE82-015220; DOE/ER-04749/T1) Avail: NTIS
HC A08/MF A01

The work described is aimed at applying arc plasma spraying (APS) to three solar energy applications, namely fabrication of silicon solar cells from polycrystalline silicon layers deposited by arc plasma spraying on suitable substrates; preparation of selective absorber surfaces for solar thermal energy absorbers by arc plasma spraying semiconductors over metal (aluminum, steel, etc.) substrates, and fabrication of inexpensive, durable ohmic contacts to single crystal and polycrystalline solar cells by arc plasma spraying appropriate metals and alloys onto both the light receiving and back surfaces of the photovoltaic device. To summarize briefly, the most successful of the three activities was that aimed at making ohmic contacts by arc plasma spraying; it requires additional work to establish commercial viability, but its technical feasibility has been demonstrated. DOE

N83-20409# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SOLAR ELECTRIC TECHNOLOGIES: METHODS OF ELECTRIC UTILITY VALUE ANALYSIS
James R. Harper and C. David Percival May 1982 72 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-014285; SERI/TR-214-1362) Avail: NTIS
HC A04/MF A01

Methods are described for determining the financial value of solar-electric technologies to electric utilities. The methods are performed by packages of computer models available from SERI that can be interfaced with most conventional utility planning methods. The output of these models gives a financial break-even value ($/ kW) of the solar-electric system under consideration in the specific utility systems. General descriptions of the value methods for wind, solar thermal electric, photovoltaic, base load solar (OTEC and biomass) load management, and conservation technologies are included. DOE

N83-20410# Washington Resources, Inc., Washington, D.C.
ANALYSIS OF THE ECONOMICS OF TYPICAL BUSINESS APPLICATIONS OF SOLAR ENERGY
11 Nov. 1981 59 p
(Contract DE-FG02-77CS-34103)
(DE82-013419; MASEC-SCR-81-093) Avail: NTIS
HC A04/MF A01

An economic analysis is provided of flat plate collector systems in industrial, commercial, and agricultural business applications in a variety of locations. A key element of the analysis is the federal solar investment tax credit. The SOLCOST Solar Energy Design Program is used for the study. The differences between industrial agricultural and commercial applications are considered, as are finance and tax data and fuel data. The rate of return and payback are the criteria used to compare the economic viability of systems. Market penetration estimates for process steam were derived for seven southwestern states where direct solar radiation is highest. DOE

N83-20411# New Zealand Energy Research and Development Committee, Auckland.
PRESENT AND POTENTIAL USE OF MICRO-HYDROELECTRIC SCHEMES IN REMOTE LOCATIONS
R. J. Blakely and K. F. OConnor Oct. 1981 44 p refs
(DE82-904687; NZERDC-68) Avail: NTIS (US Sales Only)
HC A03/MF A01; DOE Depository Libraries

The prospects for generating electric power from mountain streams in remote areas of New Zealand are discussed. Information is provided on public attitudes toward microscale hydroplants, the equipment available for such plants, and the cost of the power generated. Data on turbines in use at present are tabulated. It is recommended that sites be evaluated on an individual basis and that the development of New Zealand produced hydroequipment and control systems for microscale hydroplants be encouraged. DOE

N83-20412# New Zealand Energy Research and Development Committee, Auckland.
SMALL HYDRO-ELECTRIC POTENTIAL: WEST POVERTY BAY REGION
Jul. 1981 67 p refs
(DE82-905090; NZERDC-66) Avail: NTIS (US Sales Only)
HC A04/MF A01; DOE Depository Libraries

Six schemes in the Bay of Plenty Electric Power Board area and two in the Poverty Bay Electric Power Board area, of which five and one, respectively are below the economic limit of $2400/kW were identified. Only three appear both economically and environmentally acceptable. The schemes identified are not very attractive on the national scale and could not be justified on local terms. It is recommended that a detailed feasibility study of the Takaputahi/Torere diversion is undertaken prior to a decision making to proceed with the Motu development, or if the proposals are dropped. The present low load and slow growth of the area is such that prior to a small hydroelectric scheme is built, demand for power has to be established. DOE

N83-20413# AeroVironment, Inc., Pasadena, Calif.
DEFINITION OF COST-EFFECTIVE RIVER-TURBINE DESIGNS Final Report, 30 Sep. 1980 - 31 Dec. 1981
R. L. Radkey and B. D. Hibbs Dec. 1981 189 p refs
(Contract DE-FC07-80ID-12204)
(DE82-010972; AV-FR-81/595) Avail: NTIS HC A09/MF A01

Low pressure run-of-the-river turbines are discussed. These river turbine units will operate on the equivalent of less than 0.2 m (7 in.) of head, and in a river with a reasonable current resource, the units are estimated to reduce cost-effective electricity. Two system concepts were evaluated: a ducted turbine system, and a free-rotor system. The ducted turbine uses an augmenter duct to increase volume flow through the turbine rotor, and the free-rotor system is essentially an underwater windmill. The program

consisted the following tasks: define river current resources; design ducted and free-rotor systems and develop performance estimates; determine system cost estimates and conduct an economic analysis; and conduct a model test program to substantiate duct augmentation. The overall conclusion is that both ducted and free-rotor turbine system can produce cost-effective electricity. DOE

N83-20414# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.

DIRECT LIQUEFACTION OF BIOMASS: RESULTS FROM OPERATION OF CONTINUOUS BENCH SCALE UNIT IN LIQUEFACTION OF WATER SLURRIES OF DOUGLAS FIR WOOD

Larry L. Schaleger, Carlos Figueroa, and Hubert G. Davis May 1982 27 p refs Presented at the 4th Symp. on Biotechnol. in Energy Production and Conservation, Gatlinburg, Tenn., 11-14 May 1982

(Contracts W-7405-eng-48; DE-AC06-76RL-01830; DE-AC03-76SF-00098; DE-AC06-76LO-1830)

(DE82-015703; LBL-14019; CONF-820580-1) Avail: NTIS HC A03/MF A01

A continuous liquefaction unit (CLU) is discussed. The operation was single pass, feeding water slurries of prehydrolyzed Douglas fir wood (LBL process). Significant differences from results with the oil slurry, high oil, and water recycle process (PERC process) were found. The LBL process, at practicable temperatures and residence times, makes somewhat less wood oil and considerably more water-soluble product than does PERC. Consumption of carbon monoxide in LBL, other than by water gas shift reaction, is minimal, as opposed to several tenths of a mole per 100 grams of wood in PERC. Replacement of carbon monoxide with hydrogen as reactant gas makes little or no difference in yield distribution or product analysis. Progress in characterizing the oil and water-soluble product, the overall stoichiometry of the LBL and PERC processes, and the role of formate ion are described. GRA

N83-20415# Wright-Malta Co., Ballston Spa, N. Y.

CATALYZED STEAM GASIFICATION OF BIOMASS. PHASE 3: BIOMASS PROCESS DEVELOPMENT UNIT (PDU) CONSTRUCTION AND INITIAL OPERATION

James J. Healey and Roger H. Hooverman Dec. 1981 81 p

(Contract DE-AC02-78ET-23025)

(DE82-010264; DOE/ET-23025/26) Avail: NTIS HC A05/MF A01

The design and construction of the process development unit (PDU) are described in detail, examining each system and component in order. Siting, the chip handling system, the reactor feed system, the reactor, the screw conveyor, the ash dump system, the PDU support equipment, control and information management, and shakedown runs are described. DOE

N83-20416# Lincoln Lab., Mass. Inst. of Tech., Lexington.

PHOTOVOLTAIC/THERMAL COLLECTOR DEVELOPMENT PROGRAM Final Report

S. D. Hendrie Mar. 1982 115 p refs

(Contract DE-AC02-76ET-20279)

(DE82-012572; DOE/ET-20279/168) Avail: NTIS HC A06/MF A01

The development of combined photovoltaic/thermal (PV/T) collectors began with the testing of commercially produced air and liquid PV/T prototype units and culminated in a second generation of collector units. Both air-and liquid-type collectors were developed as part of the second-generation effort. A number of concept designs, including a two phase flow and an unglazed PV/T unit, were also studied. The results of early collector testing and the design of the second-generation units are detailed. Performance results for second-generation units are included. B.G.

N83-20417# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

PHOTOBIOLOGY TASK OF THE ADVANCED SOLAR ENERGY RESEARCH PROGRAM Progress Report, 1 Apr. - 30 Sep. 1980

M. Seibert, S. Lien, P. Weaver, J. Schultz, and P. Roessler Mar. 1982 48 p refs

(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)

(DE82-012310; SERI/PR-233-1395) Avail: NTIS HC A03/MF A01

Three areas of photobiological research are currently under investigations: in vivo microbial hydrogen photoproduction, algal hydrocarbon production, and in vitro energy conversion. The first involves environmental and mutational analyses of metabolism and electron transport in photosynthetic bacteria, leading to enhanced hydrogen photoproduction by these organisms. Also included in the first area is the characterization of algal hydrogenases and both the biochemical and genetic manipulation of algal electron transport to enhance in vivo hydrogen photoproduction. The second seeks to identify algal strains that produce large amounts of oil or hydrocarbons and to understand the mechanisms and biochemistry involved. The third is aimed at electrically coupling photoactive biological complexes to metal and semiconductor electrodes. DOE

N83-20418# Midwest Research Inst., Golden, Colo. Biotechnology Research Branch.

DEVISING EFFICIENT BIOTECHNOLOGICAL PROCESSES FOR THE PRODUCTION OF FUELS AND CHEMICALS FROM BIOMASS Annual Report for FY 1981

Ruxton Villet May 1982 158 p refs

(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)

(DE82-017089; SERI/PR-232-1511) Avail: NTIS HC A08/MF A01

Research directed toward improving ethanol processes based on readily fermentable feedstocks is discussed. Efforts were also made to develop novel fermentation systems. Reducing the cost of producing ethanol and other chemicals requires using cellulosics as feedstocks, which when hydrolyzed form hexose sugars readily metabolized by yeast. A program was undertaken to discover thermophilic organisms that convert various biopolymers to ethanol and other chemical products. Lipids suitable as diesel oil extenders are produced by microorganisms. A screening program was undertaken to identify microbial strains with a biotechnological potential. This involved a precise, quantitative chemical analysis of lipid products. Some work on developing a 2,3-butanediol fermentation process is described. During the fermentation process ethanol is also produced. To improve the ratio of butanediol to ethanol, a program of genetic and physiological research was designed and initiated. DOE

N83-20419# Department of Energy, Washington, D. C.

ASSESSMENT OF THE BASIC ENERGY SCIENCES PROGRAM. VOLUME 2: APPENDICES

Mar. 1982 102 p refs

(DE82-013245; DOE/ER-0123-Vol-2) Avail: NTIS HC A06/MF A01

A list of experts reviewing the basic energy sciences (BES) program and their organizations are given. The assessment plan is explained; the program examined the following: quality of science being conducted in the program, quality of performers supported by the basic energy sciences (BES) program, and the impact of the research on mission oriented needs. The intent of the assessment is to provide an indication of general status relative to these questions for the BES divisions. The approach to the assessment is described. The sampling plan which was used as a guide in determining the sample size and selecting the sample to evaluate the research program are discussed. Special analyses were conducted on the dispersion of reviewers' ratings, the ratings of the lower funded projects, and the amount of time the principal investigator devoted to the project. These are presented in the final appendix together with histograms for individual rating variables for each program area. DOE

N83-20420# Brookhaven National Lab., Upton, N. Y.

ENERGY PLANNING FOR DEVELOPMENT: NEEDS AND APPROACHES

V. Mubayi 1981 14 p refs Presented at 5th Intern. Sci. Forum

on Changes in Energy, Mexico City, Mexico, 9 Nov. 1981
(Contract DE-AC02-76CH-00016)
(DE82-014180; BNL-31208; CONF-811196-1) Avail: NTIS HC A02/MF A01

The capability of developing countries to carry out comprehensive national energy planning is examined. The analytical methods or models constructed for analyzing the energy system have to take into account the specific context in which they are built to address issues of interest to development planners. Issues discussed are resource development and technology research, energy equity considerations to all peoples in a nation, the pricing policy, and the balance of payments considerations. The importance of the availability of adequate skilled personnel and training programs to impart the requisite skill necessary to carry out the planning is discussed. Various surveys were conducted to determine the training needs for energy planners in developing countries. DOE

N83-20421# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
THE PLASMADYNAMICS AND IONIZATION KINETICS OF THERMIONIC ENERGY CONVERSION
John L. Lawless, Jr. and S. H. Lam Feb. 1982 198 p refs
(Contract DE-AC02-76ET-15352)
(DE82-012938; DOE/ET-15352/T1; COO-2533-13) Avail: NTIS HC A09/MF A01

The reduction of the plasma arc/drop, thermionic energy conversion was studied. The plasmadynamic and ionization recombination theories were simplified. These are applied to a scheme proposed, using laser irradiation to enhance the ionization kinetics of the thermionic plasma and thereby reduce the arc drop. It is possible to generate the required laser light from a thermionic type cesium plasma. It is shown that large laser ionization enhancements can occur and that collisional cesium recombination lasing is expected. A numerical method is developed to solve the thermionic plasma dynamics. A finite difference computer program is constructed to combine the analysis of ionization recombination kinetics with the plasma dynamics of thermionic conversion. It is capable of solving for both unsteady and steady thermionic converter behavior including possible laser ionization enhancement or atomic recombination lasing. In this proposed scheme, laser radiation impinging on a thermionic plasma enhances the ionization process thereby raising the plasma density and reducing the plasma arc drop. A source for such radiation may possibly be a cesium recombination laser operating in a different thermionic converter. The energy efficiency of this process is discussed. DOE

N83-20422# California Univ., Berkeley. Lawrence Berkeley Lab.
PROSPECTS FOR THE DEVELOPMENT OF NON-NOBLE METAL CATALYSTS FOR HYDROGEN-AIR FUEL CELLS Final Report
Philip N. Ross, Jr. and Frederick T. Wagner Mar. 1982 65 p refs
(Contract W-7405-eng-48)
(DE82-013875; LBL-14192) Avail: NTIS HC A04/MF A01

The purpose of this report is to review the literature on the electrocatalysis of hydrogen-air fuel cells in order to determine the prospects for replacing Pt in transportation fuel cells and to suggest research directions which might lead to the development of non-Pt (more generally, non-noble metal) catalysts. The study is restricted to catalysts for the air electrode with an emphasis primarily on acid electrolyte fuel cells using reformed hydrocarbon fuels (e.g., methanol). The classes of materials which have been reviewed include transition metal oxides, sulfides, selenides, the refractory interstitial compounds (e.g., carbides, nitrides, silicides and borides of Ti, W, etc.), and aromatic macrocyclic porphyrins and phthalocyanines. Quantitative comparison of all classes of materials was not possible due to that variety of methods employed to measure catalytic activity and combinations of temperature and electrolyte used. A procedure was derived whereby a semi-quantitative (order of magnitude) comparison was possible by normalizing the reported activity to that for Pt in comparable physical form (foils, wires, powders, dispersed, etc.) at the same temperature in the same electrolyte. DOE

N83-20423# Oak Ridge National Lab., Tenn. Program Planning and Analysis.
POTENTIAL BENEFITS OF R AND D DIRECTED TOWARD INCREASING THE COST-EFFECTIVENESS OF ENERGY USE
Truman D. Anderson 17 Mar. 1982 9 p ref
(Contract W-7405-eng-26)
(DE83-013435; DOE/NBM-2013435) Avail: NTIS HC A02/MF A01

The need for energy research programs directed toward increasing the cost effectiveness of energy use is discussed. Benefits reaped by society as a consequence of successful completion of a research activity are economic, environmental, health and safety, and security. Emphasis is placed on the economic benefits from research projects on the demand side (i.e., energy end use sectors). Each end use sector was examined and data on the amount of energy consumed and the estimated cost of that energy are compiled. DOE

N83-20424# Department of Energy, Washington, D. C. Office of Consumption Data System.
INTRODUCTION TO THE NONRESIDENTIAL BUILDINGS ENERGY-CONSUMPTION SURVEY: 1979-1980 BUILDING CHARACTERISTICS, ENERGY END USE AND FUEL OIL TANK DATA. PUBLIC USE DATA TAPES, SHOPPERS' GUIDE
Feb. 1982 53 p refs
(DE82-012522; DOE/EIA-0326) Avail: NTIS HC A04/MF A01

The nonresidential Buildings Energy Consumption Survey (NBECS) was designed to provide information related to energy consumption in nonresidential buildings. A representative sample of all nonresidential buildings in the 48 contiguous states and the District of Columbia was selected using a multistage area probability technique. This document is intended to serve as a general introduction to the building characteristics, energy end use, and fuel oil tank data from the 1979-1980 NBECS. These data are available to the public on machine readable magnetic tape. DOE

N83-20425# Los Alamos Scientific Lab., N. Mex.
CERENKOV RADIATORS FOR PHOTODIODES
James W. Toevs, Carlton S. Young, Paul A. Zagarino (Edgerton, Germeshausen and Grier, Inc., Santa Barbara, Calif.), and Robert D. Seno (Edgerton, Germeshausen and Grier, Inc., Las Vegas, Nev.) 1982 11 p Presented at the Defense Nucl. Agency Conf. on Instrumentation for Nucl. Weapons Effects., White Oak, Md., 30 Mar. - 1 Apr. 1982
(Contract W-7405-eng-36)
(DE82-012146; LA-UR-82-833; CONF-820334-3) Avail: NTIS HC A02/MF A01

Several materials were examined for use as Cerenkov converters in front of photodiodes in an effort to find a gamma detector system that has more sensitivity than a Compton detector but makes little sacrifice in bandwidth. Suprasil (fused silica) and UVT Lucite (acrylic) were 10 to 100 times more sensitive than a Compton detector and provided almost the same bandwidth. Barium fluoride provided almost 1000 times the sensitivity, but with a factor of 3 or 4 reduction in bandwidth. Relative sensitivities are strongly dependent on beam composition; the Cerenkov package is less sensitive to a pure gamma ray beam than to a gamma electron shower beam. Hence, beam composition must be considered in any application of these detectors. DOE

N83-20426# Mid-American Solar Energy Complex, Minneapolis, Minn. Div. of State Energy.
WISCONSIN COLLECTOR-EFFICIENCY STUDY, PHASE TWO
Bonnie L. Albright 15 Jan. 1982 24 p Prepared in cooperation with the Wisconsin Dept. of Administration, Madison
(Contract DE-AC02-79CS-30150)
(DE82-013425; MASEC-SCR-82-001) Avail: NTIS HC A02/MF A01

The collector efficiency study developed a solar collector rating methodology specific to Wisconsin conditions. Existing rating programs were researched and a collector methodology was developed. A computer program was written to calculate the collector ratings and 25 collector models were rated. The accuracy

of the proposed rating methodology was evaluated for 16 collectors placed in 11 domestic hot water systems. One liquid space heating analysis with storage and one air space heating analysis without storage were completed. A solar assisted heat pump in which the solar collectors function as evaporators was also analyzed. DOE

N83-20427# Center for Renewable Resources, Washington, D.C.
PUTTING RENEWABLE ENERGY TO WORK IN CITIES Final Report
Beth McPerson, ed., Gerald Mara, Kathleen Courier, ed., and Kevin Finneran 1982 463 p refs
(Contract DE-AC01-79ET-20622)
(DE82-016178; DOE/ET-20622/T1) Avail: NTIS HC A20/MF A01

The purpose of the book is to supply city officials with information needed to develop local policies that encourage the use of energy conservation and renewable energy technologies. The basic assumptions are that city energy officials need technical information, that urban energy managers must be conscious of the constraints and opportunities posed by existing conditions and that no urban program can afford to overlook the links between energy and housing, employment, and economic development. Part One contains guidelines to help local energy officials assess their own urban energy contexts. Parts Two and Three indicate how different energy technologies might fit within different city contexts or neighborhoods. DOE

N83-20428# Brookhaven National Lab., Upton, N. Y. Solar Technology Group.
LOW-COST, HIGH-PERFORMANCE SOLAR FLAT-PLATE COLLECTORS FOR APPLICATIONS IN NORTHERN LATITUDES
William G. Wilhelm 1981 8 p ref Presented at the 2nd Intern. Conf. on Energy for Rural and Island Communities, Glasgow, 1-4 Sep. 1981
(Contract DE-AC02-76CH-00016)
(DE82-010626; BNL-30633; CONF-8109112-1) Avail: NTIS HC A02/MF A01

Solar flat plate collector designs were developed which incorporate high performance polymer film and laminate technology that have a projected manufacturing cost approaching $15/sq m. Their potential thermal performance is consistent with the best commerical solar flat plate collectors available today. DOE

N83-20429# Southern California Gas Co., Los Angeles.
METAL HYDRIDE/CHEMICAL HEAT-PUMP DEVELOPMENT PROJECT, PHASE 1 Final Report
T. A. Argabright Feb. 1982 187 p refs
(Contract DE-AC02-76CH-00016)
(DE83-002463; BNL-51539) Avail: NTIS HC A09/MF A01

The metal hydride/chemical heat pump (MHHP) is a chemical heat pump containing two hydrides for the storage and/or recovery of thermal energy. It utilizes the heat of reaction of hydrogen with specific metal alloys. The MHHP design can be tailored to provide heating and/or cooling or temperature upgrading over a wide range of input and ambient temperatures. The system can thus be used with a variety of heat sources including waste heat, solar energy or a fossil fuel. The conceptual design of the MHHP was developed. A national market survey including a study of applications and market sectors was conducted. The technical tasks including conceptual development, thermal and mechanical design, laboratory verification of design and material performance, cost analysis and the detailed design of the Engineering Development Test Unit (EDTU) were performed. As a result of the market study, the temperature upgrade cycle of the MHHP was chosen for development. Operating temperature ranges for the upgrader were selected to be from 70 to 1100 C (160 to 2300 F) for the source heat and 140 to 1900 C (280 to 3750 F) for the product heat. DOE

N83-20430# Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering.
DESIGN OF PLYWOOD AND PAPER FLYWHEEL ROTORS Final Report
A. G. Erdman, D. L. Hagen, and S. A. Gaff May 1982 133 p refs
(Contract W-7405-eng-48)
(DE83-002276; UCRL-15504) Avail: NTIS HC A07/MF A01

Technical and economic design factors of cellulosic rotors are compared with conventional materials for stationary flywheel energy storage systems. Wood species, operation in a vacuum, assembly and costs of rotors are evaluated. Wound kraft paper, twine and plywood rotors are examined. Two hub attachments are designed. Support stiffness is shown to be constrained by the material strength, rotor configuration and speed ratio. Preliminary duration of load tests was performed on vacuum dried hexagonal birch plywood. Dynamic and static rotor hub fatigue equipment is designed. Moisture loss rates while vacuum drying plywood cylinders were measured, and the radial and axial diffusion coefficients were evaluated. Diffusion coefficients of epoxy coated plywood cylinders were also obtained. Economics of cellulosic and conventional rotors were examined. Plywood rotor manufacturing costs were evaluated. The optimum economic shape for laminated rotors is shown to be cylindrical. Vacuum container costs are parametrically derived and based on material properties and costs. Containment costs are significant and are included in comparisons. The optimum design stress and wound rotor configuration are calculated for seventeen examples. Plywood rotors appear to be marginally competitive with the steel hose wire or E glass rotors. High performance oriented kraft paper rotors potentially provide the lowest energy storage costs in stationary systems. DOE

N83-20431# Oak Ridge National Lab., Tenn. Energy Div.
ENERGY-DATA VALIDATION: AN OVERVIEW AND SOME CONCEPTS
A. S. Loebl and S. Cantor 1981 18 p refs Presented at the Am. Statist. Assoc. Meeting, Detroit, 10 Aug. 1981
(Contract W-7405-eng-26)
(DE82-020901; CONF-810842-7) Avail: NTIS HC A02/MF A01

Energy data validation can be viewed operationally as a three-fold assessment process: (1) a determination of the quality of the data collected, i.e., an assessment of accuracy; (2) an analysis of the relevance and usefulness of the data so as to assess how closely the data collected is meeting the requirements of its users; (3) an assessment of measures that can be taken to enhance the effectiveness of the data system under study. Assessment (1) is akin to the process of critical evaluation of data in the physical sciences. Assessments (2) and (3), the more distinctive features, underlie two important goals of validation. In brief, the analyst validates both the information and the requirements for the information, and as deficiencies in these two aspects are uncovered, the validation analyst formulates and evaluates the means for correcting these deficiencies. This paper focuses upon the use of an error model for systematizing the assessment of accuracy in a data-system validation study. DOE

N83-20432# Oak Ridge National Lab., Tenn.
NEW PHYSICAL-CHEMICAL REACTIONS USEFUL FOR TES
James S. Johnson, Jr. and C. Gary Westmoreland 1982 5 p refs Presented at the Energy Storage Contractors Rev. Meeting, Arlington, Va., 23 Aug. 1982
(Contract W-7405-eng-26)
(DE82-020807; CONF-820827-11) Avail: NTIS HC A02/MF A01

New options in materials for heat storage is the aim of the program. Chemical systems, including those having equilibria with high temperature coefficients, are tested by differential scanning calorimetry for evidence of enhanced heat capacity. The approach is high-risk and exploratory; and in the search for new classes of storage systems, relatively little weight is given the costs of members of the classes that are at present apparent. Several possibilities have been tested in a preliminary way. These include concentrated aqueous solutions of a hydrolyzable metal ion; aqueous solutions of polyethylene oxide-polypropylene oxide polymers, which when cross-lindked take up or eject water in temperature cycles; and soluble partially fluorinated organic compounds, in hope that hydrates might be formed and be melted in temperature ranges of interest (analogous to clathrates). Certain

petroleum ester waxes have also been tested. No promising embodiments have been found so far, but the survey is too incomplete as yet to rule any out. DOE

N83-20433# Stanford Univ., Calif.
WORLD OIL
J. L. Sweeney Jun. 1982 129 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 875-1-8)
(DE82-906440; EPRI-EA-2447-SY) Avail: NTIS HC A07/MF A01

Results obtained through the application of 10 prominent world oil or world energy models to 12 scenarios are reported. These scenarios were designed to bound the range of likely future world oil market outcomes. Conclusions relate to oil market trends, impacts of policies on oil prices, security of oil supplies, impacts of policies on oil security problems, use of the oil import premium in policymaking, the transition to oil substitutes, and the state of the art of world oil modeling. DOE

N83-20434# Idaho National Engineering Lab., Idaho Falls.
STATUS OF DOE SMALL HYDROPOWER RESEARCH AND DEVELOPMENT PROJECTS
E. H. Magleby, ed., B. N. Rinehart, ed., and J. R. Chappell, ed. Oct. 1982 26 p refs
(Contract DE-AC07-76ID-01570)
(DE83-001353; EGG-HYD-6024) Avail: NTIS HC A03/MF A01

The results and the status of small hydropower R and D projects are presented. Also included is an updated bibliography of completed reports. In most cases, reports are published to make available the research, engineering, operating, regulatory or cost information from the projects that are pertinent to hydropower development by private and nonfederal government sectors. DOE

N83-20435# CSI Resource Systems, Inc., Boston, Mass.
BI-STATE SOLID-WASTE-TO-ENERGY PROJECT
Dec. 1982 160 p Prepared in cooperation with Bi-State Development Agency, St. Louis
(Contract DE-FG01-79CS-20233)
(DE83-004458; DOE/CS-20233/1) Avail: NTIS HC A08/MF A01

The system concept developed will comprise a 600 ton per day waste-fired facility (with supplemental oil or gas fired package boilers) selling steam to the City of St. Louis. The history of activities is presented, and project activities are summarized in 10 major task areas: waste quantity and characteristics; energy and materials market development and negotiations; technical and market evalution of the steam loop; final site and system selection; environmental impact assessment; economic and financial analysis; structuring of the project; procurement documents preparation and issue; contractor selection and negotiation; and project management. For each task, the activities performed, its status, and conclusions as appropriate are presented. GRA

N83-20436# Economic Research Service, Washington, D. C. Natural Resource Economics Div.
PROGRESS OF SOLAR TECHNOLOGY AND POTENTIAL FARM USES
Walter G. Heid, Jr. and Warren K. Trotter Sep. 1982 121 p refs
(PB83-100065; AER-489) Avail: NTIS HC A06/MF A01 CSCL 02B

The efficient use of solar energy on farms for space heating and cooling of livestock buildings, drying crops, and heating farm homes is discussed. Low cost, homemade solar collectors, having multiple uses and a payback of less than 5 years, are the most popular systems. In contrast, most commercially produced systems are still too expensive for agricultural uses, partly because they fail to qualify for tax credits as large as those allowed for residential uses. The solar industry has shown little interest in marketing the low cost technologies specifically developed for agriculture. Author (GRA)

N83-20437# United Technologies Corp., South Windsor, Conn. Power Systems Div.
ON-SITE FUEL CELL POWER PLANT TECHNOLOGY DEVELOPMENT PROGRAM Annual Report, Jan. - Dec. 1981
A. P. Mientek Jul. 1982 138 p
(PB83-102335; GRI-80/0162; FCR-4111A) Avail: NTIS HC A07/MF A01 CSCL 10B

Fuel cell power plant designs, specifications and technologies were evaluated to define a power plant approach having the potential for meeting initial on-site commercial service market requirements and costs. An intial commerical market segment was defined for a range of power plant sizes. A preliminary power plant specification and model power plant system were selected as a baseline for further technology development and cost reduction efforts in subsequent program phases. Inverter designs with advanced individual commutation circuitry were defined and evaluated. Sulphur-tolerant reformer catalysts were tested and cell performance on sulphur-bearing fuels was determined. Electrode substrates having greater electrolyte storage capacity and intercell cooler concepts having improved corrosion resistance were developed. GRA

N83-20438# National Science Foundation, Washington, D.C. Div. of Policy Research and Analysis.
WORKSHOP ON THE FEDERAL ROLE IN THE COMMERCIALIZATION OF LARGE SCALE WINDMILL TECHNOLOGY (SUMMARY AND PAPERS)
James I. Lerner and Grant Miller 1982 141 p refs Workshop held at Washington, D.C., 25-26 Sep. 1980
(PB83-105593; NSF/PRA-82012) Avail: NTIS HC A07/MF A01 CSCL 10B

Large-scale wind system and windmill technology and prospects for commercial applications are discussed. Barriers that may affect the commerical viability of large-scale windmill systems are identified, including the relatively poor financial condition of much of the utility industry which effectively prevents many utilities from investing substantially in any new projects. The potential market addressed by the Federal program in large-scale windmill systems is examined. Some of the factors that may limit the degree of market penetration for wind energy systems are: costs of competing fossil and nuclear fuels and technologies; rate of acceptance of new technologies; and competition from other solar technologies, including biomass, solar thermal, and photovoltaic systems. Workshop participants agreed that existing Federal legislation provides significant incentives for the commercialization of large-scale wind machines. GRA

N83-20439# United Technologies Corp., South Windsor, Conn. Power Systems Div.
ON-SITE FUEL CELL FIELD TEST SUPPORT PROGRAM Annual Report, May 1980 - Jun. 1981
J. W. Staniunas and G. P. Merten Jan. 1982 199 p refs Sponsored by Gas Research Inst.
(PB83-121723; FCR-3859; GRI-81/0034) Avail: NTIS HC A09/MF A01 CSCL 10B

In order to assess the impact of grid connection on the potential market for fuel cell service, applications studies were conducted to identify the fuel cell operating modes and corresponding fuel cell sizing criteria which offer the most potential for initial commercial service. The market for grid-connected fuel cell service was quantified using United's market analysis program and computerized building data base. Electric and gas consumption data for 268 buildings was added to our surveyed building data file, bringing the total to 407 buildings. These buildings were analyzed for grid-isolated and grid-connected fuel cell service. The results of the analyses indicated that the nursing home, restaurant and health club building sectors offer significant potential for fuel cell service. GRA

N83-20440# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
SNG FROM LAND-BASED BIOMASS 1981 PROGRAM Final Report, Jul. - Dec. 1982
K. Jain, B. Ruddy, and R. Makinen Jan. 1982 123 p refs Sponsored by Gas Research Inst.

(PB83-10467; GRI-81/0031) Avail: NTIS HC A06/MF A01 CSCL 07A

The planning and systems analysis aspects for developing regional commercial scale methane production systems are discussed. The interim results presented include a preliminary program plan, a review of literature data on two system concepts, and a description of the system analysis methodology. One methane production concept is based on anaerobic digestion of a sorghum based feedstock and the other on thermal gasification of hybrid poplar. System studies on the production and conversion of the two feedstocks are reviewed. GRA

N83-20441# Insights West, Inc., Los Angeles, Calif.
SOLAR-AUGMENTED APPLICATIONS IN INDUSTRY. PHASE 2: CONCEPTUAL DESIGNS, VOLUME 1 Final Report, Jun. 1980 - Dec. 1981
Richard A. Casper, David W. Kearney, and John H. Williams Jul. 1982 192 p Sponsored by Gas Research Inst.
(PB83-102301; GRI-80-0016) Avail: NTIS HC A09/MF A01 CSCL 10A

The objective of this project was to carry out conceptual designs of solar/gas energy systems for industrial process heat applications at the plants of selected industrial participants. Agreements were secured from eight industrial firms to participate in a solar/gas IPh conceptual design program. The conceptual designs were cmpleted as planned, examining the solar/gas interface, process energy needs, the solar system requirements, and the economics of the installation. Five of the designs were recommended for consideration as field test sites. Subsequent field development activities are deferrred pendng a detailed assessment of the R&D required for cost-competitive solar/gas systems. GRA

N83-20442# Battelle Pacific Northwest Labs., Richland, Wash.
ENERGY EFFICIENT INDUSTRIAL TECHNOLOGY IN EUROPE: A COMPENDIUM Interim Report, May 1979 - Feb. 1982
A. G. Fassbender and M. J. McGee 1 May 1982 160 p refs Sponsored by Gas Research Inst.
(PB83-102327; BPNL-2311204625; GRI-80/0147) Avail: NTIS HC A08/MF A01 CSCL 10A

Energy efficient industrial technologies currently in use in Europe are described. Gas-fired equipment in West Germany, France, and the United Kingdom is emphasized. Some of these technologies are unique. and some are currently available in the United States. Load management, cogeneration, heat recovery, and various industrial processes are discussed. GRA

N83-19780*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Systems Engineering Section.
AN OVERVIEW OF THE GOLDSTONE ENERGY SYSTEMS STUDY
L. S. Rosenberg *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 135-141 (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 10B

N83-19781*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. DSN Engineering Office.
PERFORMANCE SIMULATION OF THE JPL SOLAR-POWERED DISTILLER. PART 1: QUASI-STEADY-STATE CONDITIONS
C. S. Yung and F. L. Lansing *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 142-160 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 10A

N83-19782*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. DSN Engineering Section.
EFFICIENT COMPUTERIZED MODEL FOR DYNAMIC ANALYSIS OF ENERGY CONVERSION SYSTEMS
R. D. Hughes, F. L. Lansing, and I. R. Khan *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 161-176 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 10A

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N83-20443# Committee on Merchant Marine and Fisheries (U. S. House).
OCEAN DUMPING
Washington GPO 1982 758 p refs Hearings on H.R. 6112, H.R. 6113 and H.R. 6324 before the Subcomm. on Oceanog. and the Subcomm. on Fisheries and Wildlife Conserv. and the Environ. of the Comm. on Merchant Marine and Fisheries, 97th Congr., 2d Sess., 18, 23, 26 Mar. and 23 Jun. 1982
(GPO-11-267) Avail: Subcommittee on Oceanography

Hearings on the reauthorization of the Marine Protection, Research, and Sanctuaries Act and Proposed ocean dumping user fees are presented. Author

N83-20444# Committee on Science and Technology (U. S. House).
HAZARDOUS WASTE
Washington GPO 1982 93 p Hearing before the Subcomm. on Natural Resources, Agr. Res. and Environ. of the Comm. on Sci. and Technol., 97th Congr., 1st Sess., 7 Dec. 1981
(GPO-90-943) Avail: Subcommittee on Natural Resources, Agriculture Research and Environment

Problems of toxic waste are considered. Author

N83-20445*# Man-Acoustics and Noise, Inc., Seattle, Wash.
A STUDY OF NOISE METRIC AND TONE CORRECTION ACCURACY Final Report, Oct. 1979 - Feb. 1982
B. M. Sullivan and J. E. Mabry Apr. 1982 72 p refs
(Contract NAS1-15955)
(NASA-CR-165910; NAS 1.26:165910; MAN-106) Avail: NTIS HC A04/MF A01 CSCL 13B

Methods currently used to measure human response to aircraft flyover noise were investigated. Response to high level aircraft noise usually experienced outdoors was obtained. Response to aircraft flyover noise typical of indoor exposure was also investigated. It was concluded that current methods for evaluating response to aircraft flyover are more accurate for outdoor noise. Author

N83-20446*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
METHOD AND APPARATUS FOR MAPPING THE DISTRIBUTION OF CHEMICAL ELEMENTS IN AN EXTENDED MEDIUM Patent Application
Jacob I. Tromka and Larry G. Evans, inventors (to NASA) (Computer Science Corp.) Filed 31 Jan. 1983 17 p
(NASA-Case-GSC-12808-1; US-Patent-Appl-SN-462497) Avail: NTIS HC A02/MF A01 CSCL 13B

A neutron/gamma ray technique for mapping the distribution of contaminants in an extended medium such as the wall of a building is described. A neutron excitation source is located on one side of the wall and a gamma ray spectrometer, including a gamma ray detector, is located on the opposite side of the wall facing the excitation source. The source and detector are moved in unison in discrete steps over opposing wall surfaces so as to determine the chemical composition of the elements in a hemispheric region of the wall adjacent the detector with the radius of the region being substantially that of the mean free path distance of gamma rays emitted from elements interacting with neutrons on the detector side of the wall. NASA

N83-20447*# National Aeronautics and Space Administration. Pasadena Office, Calif.
APPARATUS AND METHOD FOR DESTRUCTIVE REMOVAL OF PARTICLES CONTAINED IN A FLOWING FLUID Patent Application
Lien C. Yang, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 14 Oct. 1980 25 p Sponsored by NASA
(NASA-Case-NPO-15426-1; US-Patent-Appl-SN-196877) Avail: NTIS HC A02/MF A01 CSCL 13B

An apparatus and method for destructively removing particles from a flowing gas containing the particles is described. The apparatus is adapted to remove carbon particles from diesel engine exhaust products. The exhaust products are directed to a predetermined location where they are rapidly vaporized and combine with oxygen in the exhaust products to form carbon dioxide. Vaporization in one embodiment is effected by a discharge grid located within an exhaust conduit, the grid being chosen so that alternate conductors and defining the grid are spaced apart a distance approximately 125 times the mean diameter of the particles to be removed. NASA

N83-20448# Argonne National Lab., Ill. Energy and Environmental Systems Div.

STATE AND LOCAL REGULATION OF DISTRICT HEATING AND COOLING SYSTEMS: ISSUES AND OPTIONS

Philip Kier, John Feit, William Hanselman (Resource Development Associates, Dayton, Ohio), Robert Loube (James Madison Univ., Harrisonburg, Va.), Charles Meek (Exxon Corp., Houston, Texas), and William Wilson (Energy Law Inst., Concord, N.H.) Nov. 1981 68 p Sponsored by DOE

(ANL/ES-126; DP-1585) Avail: NTIS HC A04/MF A01

Public regulation of district heating and cooling (DHC) systems are investigated. Any such system not completely contained within a single tract of privately owned land, or which makes retail sales of thermal energy, may be subject to the same sort of state regulation that electric and gas utilities receive. Many states apply traditional utility regulation to DHC systems, especially those that are investor-owned. State regulation of an energy utility usually establishes pervasive control over the utility's basic activities: its entry into a market, construction (though usually not siting) of its facilities, its service rates and revenue requirements, the quantiy and quality of service it provides, and the conditions under which service may be abandoned. Some states, however, take less traditional approaches to DHC regulation - including nonregulation, less regulation for DHC than for electric and gas companies, and DHC regulation on a case-by-case basis. Author

N83-20449# School of Aerospace Medicine, Brooks AFB, Tex. Crew Environments Branch.

FIELD SAMPLING AND ANALYSIS OF HYDRAZINE AND UDMH VAPORS IN AIR: THE FIREBRICK METHOD Interim Report, 1 Jan. - 31 Dec. 1981

Leonard J. Luskus and Herman J. Kilian Oct. 1982 30 p refs (AF Proj. 7930)

(AD-A121789; SAM-TR-82-29) Avail: NTIS HC A03/MF A01 CSCL 13/2

A field method to sample and analyze low concentrations of hydrazine and UDHM vapors in air, alone and in mixtures, has been developed and evaluated extensively. Sampling is based on capture and stabilization of the hydrazines on acid-impregnated crushed firebrick contained in glass tubes (6-mm ID x 10-cm length). Analyses are by spectrophotometry (para-dimethylaminobenzaldehyde for hydrazine; trisodium pentacyanoaminoferrate for UDHM). Specifications for preparing the sampling tubes and firebrick sorbent are presented in detail. Laboratory evaluation results show that the hydrazine and UDHM sampling and analytical procedures satisfy OSHA requirements for methods of sampling and analyzing workplace toxic substances. The technique is extremely useful for accurate area monitoring, as an active dosimeter, to verify hydrazine calibration gas concentrations, and to replace impinger technology in general. Because of the simplicity and ruggedness of the method, the firebrick technique is especially useful for field use (on-site sampling and analysis). Author (GRA)

N83-20450# Oklahoma State Univ., Stillwater. School of Civil Engineering.

TREATMENT COMPATIBILITY OF MUNICIPAL WASTE AND BIOLOGICALLY HAZARDOUS COMPOUNDS. VOLUME 2: APPENDIX A Final Report, 15 Jul. 1977 - 15 Jul. 1979

A. F. Gaudy, Jr., D. F. Kincannon, and T. S. Manickham Ada, Okla. EPA Jun. 1982 276 p 2 Vol.

(Grant EPA-4-805242)

(PB83-105544; EPA-600/2-82-075B-Vol-2) Avail: NTIS HC A13/MF A01 CSCL 13B

The overall objective was to gain information on the effect of priority pollutants on the performance of publicly owned treatment works employing activitated sludge as the method of secondary treatment. Information on the effects of a wide array of compounds was sought. The most useful study procedures to be used in assessing effects were sought for the purpose of aiding in formulating regulatory policy in regard to pretreatment prior to discharge to the publicly owned treatment works. Raw data is given in tables. Author (GRA)

N83-20451# Department of Energy, Washington, D. C. Office of Policy, Planning and Analysis.

COSTS TO REDUCE SULFUR DIOXIDE EMISSIONS

Mar. 1982 62 p

(DE82-013309; DOE/PE-0042) Avail: NTIS HC A04/MF A01

Costs of controlling man-made emissions of chemicals that may cause acid rain are discussed. The position of those who are calling for immediate action and implicating coal fired power-plants as the cause of the problem is examined. The costs of controlling sulfur dioxide emissions using alternative control methods available today are presented. No attempt is made to calculate the benefits of reducing these emissions since insufficient information is available to provide even a rough estimate. Information is presented in two steps. First, costs are presented as obtained through straightforward calculations based upon simplifying but realistic assumptions. Next, the costs of sulfur dioxide control obtained through several large-scale analyses are presented, and these results are compared with those obtained through the first method. DOE

N83-20452# Swedish Water and Air Pollution Research Lab., Goeteborg.

DEFINITIONS OF RELEVANT EFFICIENCY AND STRESS FACTORS

U. Wahlgren 3 Mar. 1981 26 p refs

(DE82-901365; IVL-B-600) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

A general efficiency function and related stress factors are defined from energy flow considerations. The efficiency function, or index, is related to maximum energy utilization, and stress is defined as total derivatives of the efficiency function. The efficiency function can be expressed, for an aquatic ecosystem, in terms of incident radiation, total production, total growth and the outflow at the highest trophical level. It is shown that the efficiency in principle can be measured for a lake from oxygen balance and hydrological considerations. Changes in the efficiency are intimately connected with the activity at the primary level, which contributes most of the biomass and the production in the system. Perturbations on other levels affects the total system more indirectly, and this is the reason for using total rather than partial derivatives in the stress definitions. The behavior of the efficiency function is demonstrated for a three level Lotka-Volterra-type model with competition. DOE

N83-20453# Oak Ridge National Lab., Tenn. Health and Safety Research Div.

INITIAL ATMOSPHERIC-DISPERSION MODELING IN SUPPORT OF THE MULTIPLE-SITE INCINERATION STUDY

G. A. Holton, C. A. Little, F. R. ODonnell, E. L. Etnier, and C. C. Travis Apr. 1982 91 p refs

(Contract W-7405-eng-26)

(DE82-013372; ORNL/TM-8181) Avail: NTIS HC A05/MF A01

Several modeling series which estimate population exposure to stack emissions from incineration of hazardous organic materials at 22 commercial incinerator sites are presented. These modeling series can be divided into three groups. One group estimates long- and short-term atmospheric concentrations and popluation exposures for each of 22 sites. These modeling predictions can be used to assess chronic and acute exposure. The second group consists of sensitivity analyses which show the

effect of changes in stack parameters on the number of people exposed to specified concentration levels. The third group compares concentration estimates of two atmospheric dispersion computer codes. Results of each modeling series are contained in the appendices of this report. DOE

N83-20454# Environmental Research and Technology, Inc., Concord, Mass.
EASTERN REGIONAL AIR QUALITY MEASUREMENTS, VOLUME 1 Final Report
P. K. Mueller and J. G. Watson Sep. 1982 192 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 1630-1)
(DE83-900610; EPRI-EA-1914-Vol-1) Avail: NTIS HC A09/MF A01

Regional air-quality measurements were continued to complete the final year of a continuous 2.5 year record (August 1977 through December 1979) of ground-level measurements of selected air quality and meteorological observables at nine rural sites in the eastern United States. Concentrations of SO2, NO, NO2, and O3, as well as temperature and dew point were measured continuously at all nine locations. Particulate matter samples were collected in three particle size ranges for four 2-hour daylight periods at two of the locations. These samples were analyzed for mass. Samples of particles in the approximately 2.5 (SIGMA)m size range were also collected on quartz filters to determine total noncarbonate carbon and the particle light absorption coefficient. Extensive quality assurance and quality control programs were employed to determine the accuracy and precision of all measurements; most results are precise to plus or minus 15% or better. The overall data capture was 90%. DOE

N83-20455# Dames and Moore, Bethesda, Md.
GULF COAST ECOLOGICAL INVENTORY USER'S GUIDE AND INFORMATION BASE
Angelo D. Beccasio, Nick Fotheringham, Alice E. Redfield, Ronald L. Frew, William M. Levitan, Joel E. Smith, and Jarrett O Woodrow, Jr. Slidell, La. Fish and Wildlife Service Aug. 1982 600 p
(Contract DI-14-16-0009-81-063)
(DE83-900406; FWS/OBS-82/55) Avail: NTIS HC A25/MF A01

An inventory of important ecological resources along the Gulf coast, an area of some 475,000 square kilometers (183,400 square miles) is given. This inventory is intended to provide government and industry decisionmakers with valuable ecological information which will assist in the regional siting of oil and gas processing and manufacturing facilities and their respective transportation systems. The preparation of this ecological inventory involved four major tasks: the collection, review, and analysis of available data on coastal fish and wildlife species and their habitats and special land use areas; the synthesis and compilation of these data into a format which is compatible with the requirements of 1:250,000 scale mapping. Ecological resources are summarized by their appropriate geographic zone, and descriptions and locations of species with special status and aquatic and terrestrial species of high commercial, recreational, and aesthetic value are included. The designation of more than 270 special land use areas along the Gulf coast also is provided. DOE

N83-20456# Oak Ridge National Lab., Tenn.
MAGNESIA SPRAY ABSORPTION FOR THE REMOVAL OF SO2 FROM FLUE GAS
L. K. Felker and B. Z. Egan 1982 19 p refs Presented at 183 Am. Chem. Soc. Ann. Meeting, Las Vegas, Nevada, 27 Mar. 1982
(Contract W-7405-eng-26)
(DE82-013443; CONF-820304-16-Draft) Avail: NTIS HC A02/MF A01

Regenerable methods of flue gas desulfurization, which recycle the absorbent and diminish the waste disposal problem, have been developed. One method which substitutes a magnesia (MgO) slurry for the lime/limestone slurry has been under development for several years and commercial systems have been operated. The basic chemical reactions occurring in a magnesia scrubber are known. The magnesia is hydrated in the slurry and the SO2 in the flue gas reacts to form magnesium sulfite. The magnesium sulfite formed can be dried and subsequently decomposed at higher temperature to yield MgO for recycle to the scrubber, and more concentrated SO2 for sulfuric acid or sulfur production. Thus, the magnesia FGD system both reduces scrubber sludge disposal and provides for a saleable by-product. Significant advantages could be realized by combining spray absorption technology with the regenerable magnesia flue gas desulfurization system as shown on a simplified flow chart. DOE

N83-20457# Brigham Young Univ., Provo, Utah. Combustion Lab.
BASIC COMBUSTION AND POLLUTANT-FORMATION PROCESSES FOR PULVERIZED FUELS Quarterly Technical Progress Report, 1 Jan. - 31 Mar. 1982
G. J. Germane and L. D. Smoot 15 Apr. 1982 50 p refs
(Contract DE-FG22-80PC-30306)
(DE82-013773; DOE/PC-30306-T6; QTPR-6) Avail: NTIS HC A03/MF A01

Basic combustion and pollution formation processes for pulverized solid fossil fuels is discussed. The fossil fuels under consideration include coal-water mixtures and coal chars derived from pyrolysis, liquefaction or gasification processes. Adaptation of computer code techniques to the combustion of these fossil fuels is discussed. A capillary viscometer was used to measure apparent viscosities of various slurries in oder to obtain information for sizing feed lines and determining pressure requirements for transporting slurries from the preparation tank to the reactor burner. The effects of coal type, solids loading and additive concentration for a given particle size distribution on slurry characteristics were studied. A swirl generator for the secondary air stream was designed and fabrication was begun. DOE

N83-20458# Acurex Corp., Mountain View, Calif. Energy and Environmental Div.
KINETICS OF NO SUB X FORMATION DURING EARLY STAGES OF PULVERIZED-COAL COMBUSTION Quarterly Report, 1 Jan. - 31 Mar. 1982
J. M. Kennedy, E. K. Chu, S. L. Pessagno, and W. V. Krill 30 Apr. 1982 28 p
(Contract DE-AC22-80PC-30295)
(DE82-014482; DOE/PC-30295/6; QR-6) Avail: NTIS HC A03/MF A01

Testing of the baseline Utah coal was completed, and initial tests were run on a Pittsburgh No. 8 coal. Further modifications to the reactor sampling system were required to verify carbon loss measurements. Complete data for Utah coal were subsequently obtained with good results. Tests have begun on the remaining coals in the test matrix to establish emission trends for coals of different types. Pittsburgh No. 8 has shown similar devolatization characteristics to those of the Utah coal, although weight loss appears to be slightly greater for the Pittsburgh coal. The important parameters for correlation of the devolatilization data have been identified. Correlations are currently awaiting further reduction of reactor and solid sample data. DOE

N83-20459# Radian Corp., Austin, Tex.
ACID RAIN MITIGATION STUDY. VOLUME 1: FGD COST ESTIMATES Final Report, Feb. 1980 - Feb. 1982
J. G. Ball and W. R. Menzies Sep. 1982 164 p refs
(Contract EPA-68-02-3171)
(PB83-101329; RAD-81-203-001-12-23-Vol-1;
EPA-600/2-82-070A-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 13B

Results of work to provide a consistent set of capital investment and operating costs for flue gas desulfurization (FGD) systems retrofitted to existing industrial boilers are given. The investigation of wet limestone scrubbers and lime spray drying FGD systems included: the apparent discontinuities in both FGD system capital investment and operating costs; FGD retrofit factors applied to existing boilers based on published reports; and differences between PEDCo Environmental, Inc. and Tennessee Valley Authority cost estimates for utility boiler FGD systems. These

costing issues were examined on the bases of design scope, costing factors (for equipment installation, indirect investment, etc.), year of costs, inherent strengths and weaknesses, and published data of actual system costs. Recommendations are made for the cost bases to use in further acid rain studies. Author (GRA)

N83-20460# Radian Corp., Austin, Tex.
ACID RAIN MITIGATION STUDY. VOLUME 3: INDUSTRIAL BOILERS AND PROCESSES Final Report, Feb. 1980 - Feb. 1981
J. G. Ball, C. A. Muela, and J. L. Meling Sep. 1982 90 p refs
(Contract EPA-68-02-3171)
(PB83-101337; EPA-600/2-82-070C-Vol-3;
RAD-81-203-001-12-24-Vol-3) Avail: NTIS HC A05/MF A01 CSCL 13B

Results of a 4 month study of existing industrial sources of SO2 emissions in the Acid Rain Mitigation Study (ARMS) region, including all the states east of the Mississippi River, as well as MN, IA, MO, AR, LA, ND, SD, NE, KS, OK, and TX are discussed. Study aims were to: identify and characterize existing industrial sources of SO2 emissions, identify control techniques that can be used to reduce SO2 emissions from these sources, and estimate the SO2 emission reduction potential and the associated costs in constant 1980 dollars based on application of these controls. Simplifying assumptions were made for the balance of the SO2 sources studied. In addition, since sites were not visited, the remaining useful lives of the sources were not determined, and average unit retrofit factors were estimated. Recommendations concerning the use of study results are discussed. Author (GRA)

N83-20461# Environmental Protection Agency, Corvallis, Oreg. Environmental Research Lab.
VEGETATIVE DELINEATION OF COASTAL SALT MARSH BOUNDARIES: EVALUATION OF METHODOLOGY Final Report
H. Peter Eilers, Alan Taylor, and William Sanville Sep. 1982 59 p refs
(PB83-107441; EPA-600/3-82-037) Avail: NTIS HC A04/MF A01 CSCL 13B

Legislation mandating the protection of wetlands and current pressures to convert them to other uses emphasized the need to accurately determine a wetland-upland boundary. The authors investigated six methods designed to establish such a boundary based on vegetation. Each method was applied to a common data set. The multiple occurrence, joint occurrence, and five percent methods required plant species to be classified as salt marsh, upland, and non-indicator; cluster and similarity methods required no initial classification. Close agreement between wetland-upland boundaries determined by the six methods suggests that preclassification of plants and collection of plant cover data may not be necessary to determine a defensible boundary. GRA

N83-20462# Association of Bay Area Governments, Berkeley, Calif.
THE USE OF WETLANDS FOR WATER POLLUTION CONTROL Final Report, Jun. 1978 - May 1981
Emy Chan, Taras A. Bursztynsky, Norman Hantzsche (RAMLIT Associates), and Yoram J. Litwin (RAMLIT Associates) Sep. 1982 276 p refs
(Grant EPA-R-806357)
(PB83-107466; EPA-600/2-82-086) Avail: NTIS HC A13/MF A01 CSCL 13B

Wetlands such as marshes, swamps and artificial wetlands, have been shown to remove selected pollutants from urban stormwater runoff and treated municipal wastewaters. Wetlands have produced in BOD, pathogens, and some hydrocarbons, and excel in nitrogen removal. They have been reported to act as sinks for trace metals, phosphorus and suspended solids. Physical pollutant removal mechanisms in wetlands include sedimentation, coagulation, chemical filtration, volatilization, adsorption and chelation. Vegetative mechanisms include absorption through roots, stems and leaves, filtration and chemical transformations in the plants. Although individual plant species have been studied for their pollutant removal properties, the interaction of numerous plant and animal species in pollutant removal in a wetland is not well understood. Author (GRA)

N83-20463# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
AIR POLLUTION CONTROL TECHNIQUES FOR NON-METALLIC MINERALS INDUSTRY Final Report
Aug. 1982 314 p refs
(PB83-105064; EPA-450/3-82-014) Avail: NTIS HC A14/MF A01 CSCL 13B

Air pollution control technologies for the control of particulate emissions from non-metallic mineral processing plants are evaluated. Specific control technologies considered include the use of local ventilation followed by fabric filter collection and wet dust suppression techniques. Performance data based on mass particulate measurements and visual observations are presented. In addition, the capital and annualized emission control costs for several model plant sizes are estimated. GRA

N83-20464# Iowa State Water Resources Research Inst., Ames.
THE EFFECTS OF EXCESSIVE NITROGEN AND PHOSPHORUS IN SURFACE WATERS OF A PRAIRIE MARSH
Craig B. Davis and Robert K. Neely Jul. 1982 128 p refs
(PB83-108050; ISWRRI-125; W83-00266; OWRT-A-080-IA(1))
Avail: NTIS HC A07/MF A01 CSCL 13B

Use of natural wetlands as wastewater renovation sites requires knowledge of short and long term effects of nutrient enrichment on the ecosystem. Research was carried out to assess the impact of nitrogen (N) and phosphorus (P) enriched marsh waters on levels of N and P in interstitial water, and on emergent plant production and on decomposition. Ammonium nitrate and ammonium phosphate were applied to surface water of an Iowa prairie marsh (Eagle Lake) in 1979 and 1980. Application in 1979 caused increases of ammonium N, nitrate N, and phosphate P in 15 cm interstitial water of 144, 291, and 47%, respectively. The results suggest decomposing below ground litter is a continuous source of N under both fertilized and unfertilized conditions. GRA

N83-20465# Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
HAZARDOUS WASTE TECHNOLOGY TRANSFER ASSESSMENT
Christine A. Marco and William E. Sharpe Jan. 1982 78 p refs
(Contract DI-14-34-0001-0496)
(PB83-108134; W83-00276; OWRT-C-00192-T(0496)(2)) Avail: NTIS HC A05/MF A01 CSCL 13B

An assessment was made of hazardous waste disposal technology transfer to determine the need for and suitability of information, and to identify people needing this information and the best means of providing it for their use. The scope of groundwater contamination is discussed, and disposal techniques and current regulations for groundwater protection are outlined. The information search strategy included a literature search, consultation with computerized information files, and contact with groundwater and waste disposal experts and with government agencies. Groups and individuals who may use disposal technology are identified and characterized, and user needs (technical information level, publication format) are discussed. Significant research and technology transfer products and their strengths and weaknesses are identified. Recommendations are made for three needed technology transfer products. Author (GRA)

N83-20466# Louisiana State Univ., Baton Rouge. Water Resources Research Inst.
ALGAE REMOVAL BY INDUCED AIR FLOTATION
Marty E. Tittlebaum and Stephen Holtman May 1982 45 p refs
(Contract DI-14-34-0001-1120)
(PB83-108142; W83-00277; OWRT-A-053-LA(1)) Avail: NTIS HC A03/MF A01 CSCL 13B

Investigation was made of the feasibility of induced air flotation (IAF) as a method of removing free-floating algae from water. Bench scale tests were carried out to determine removal efficiency,

run times, chemical additive concentrations, and the effects of other parameters on the process. Different organic polyelectrolytes were screened and tested as suitable additives. Significant algae removal was obtained with two medium molecular weight commercial polyelectrolytes: a cationic flocculent consisting of a quaternary ammonium salt; a cationic surfactant consisting of a tertiary amine conjugate acid. The former additive removed up to 92% algae when used as the IAF additive at 3 mg per liter at pH 10 for 2 minutes. GRA

N83-20467# Oklahoma State Univ., Stillwater. School of Civil Engineering.
TREATMENT COMPATIBILITY OF MUNICIPAL WASTE AND BIOLOGICALLY HAZARDOUS INDUSTRIAL COMPOUNDS, VOLUME 1 Final Report, 15 Jul. 1977 - 15 Jul. 1979
A. F. Gaudy, Jr., D. F. Kincannon, and T. S. Manickham Ada, Okla. EPA Jun. 1982 203 p 2 Vol.
(Grant EPA-R-805242)
(PB83-105536; EPA-600/2-82-075A-Vol-1) Avail: NTIS HC A10/MF A01 CSCL 13B

Information on the effect of priority pollutants on the performance of publicly owned treatment works employing activated sludge as the method of secondary treatment was sought. Information on the effects of a wide array of compounds was sought, as were the most useful study procedures to be used in assessing effects for the purpose of aiding in formulating regulatory policy in regard to pretreatment prior to discharge to the publicly owned treatment works. Author (GRA)

N83-20468# American Meteorological Society, Boston, Mass.
AIR QUALITY MODELING AND THE CLEAN AIR ACT: RECOMMENDATIONS TO EPA ON DISPERSION MODELING FOR REGULATORY APPLICATIONS
1981 299 p refs Sponsored in part by EPA
(PB83-106237) Avail: NTIS HC A13/MF A01 CSCL 13B

Through the Clean Air Act and its amendments, the U.S. government endeavors to protect and enhance the quality of the nation's air resources by a variety of air quality management systems. Source emissions, meteorological observations, air quality models, and air quality data are the basic components of an air quality management system. Air quality model provide a scientific means of relating emissions and atmospheric processes to provide estimates of ambient air quality values. The models consist of mathematical equations relating the release of effluents into the atmosphere to expected concentrations in ambient air. Air quality models, therefore, can be used to identify and to evaluate the level of controls required to solve industrial and urban air-pollution problems. This report addresses the use of air quality models in a regulatory framework and represents the effort of the American Meteorological Society (AMS). Author (GRA)

N83-20469# Radian Corp., Austin, Tex.
ACID RAIN MITIGATION STUDY. VOLUME 2: FGD COST ESTIMATES, APPENDICES Final Report, Feb. 1980 - Feb. 1981
J. G. Ball and W. R. Menzies Sep. 1982 228 p refs
(Contract EPA-68-02-3171)
(PB83-117366; RAD-81-203-001-12-23-Vol-2; EPA-600/2-82-070B-Vol-2) Avail: NTIS HC A11/MF A01 CSCL 13B

Results of work to provide a consistent set of capital investment and operating costs for flue gas desulfurization (FGD) systems retrofitted to existing industrial boilers are given. The investigation of wet limestone scrubbers and lime spray drying FGD systems included: the apparent discontinuities in both FGD system capital investment and operating costs; FGD retrofit factors applied to existing boilers based on published reports; and differences between PEDCo Environmental, Inc. and TVA cost estimates for utility boiler FGD systems. These costing issues were examined on the bases of design scope, costing factors (for equipment installation, indirect investment, etc.), year of costs, inherent strengths and weaknesses, and published data of actual system costs. Recommendations are made for the cost bases to use in further acid rain studies. GRA

N83-20470# GCA Corp., Bedford, Mass. Technology Div.
COAST ANALYSIS OF PROPOSED CHANGES TO THE AIR QUALITY MODELING GUIDELINES
Michael Wojcik, Jane Wojcik, Paul Bareford, Mary Havelock, and Michael Geraghty Feb. 1982 299 p
(Contract EPA-68-02-3168)
(PB83-112177; GCA-TR-81-109-G; EPA-450/4-82-014) Avail: NTIS HC A13/MF A01 CSCL 04A

The Environmental Protection Agency (EPA) developed a set of guidelines to be followed in any air quality modeling study performed for the EPA. The Guideline on Air Quality Models (AQMG) was issued in 1978 as a part of the Office of Air Quality Planning and Standards Guideline Series. Since the release of the 1978 AQMG, the EPA reviewed its effectiveness and gathered together recommendations on how the document could be improved. In 1980, a proposed revision to the 1978 AQMG was issued for review. In GCA examines the costs associated with implementing certain features of the 1980 proposed revision. Author (GRA)

N83-20471# Environmental Monitoring and Support Lab., Cincinnati, Ohio.
THE NATIONAL AIR POLLUTION BACKGROUND NETWORK, 1976 - 1980 Project Report, May 1976 - Dec. 1980
Gary Evans, Peter Finkelstein, Barry Martin, Norman Possiel, and Maurice Graves (Northrop Services Inc., Research Triangle Park, N.C.) Aug. 1982 56 p refs
(PB83-100412; EPA-600/4-82-058) Avail: NTIS HC A04/MF A01 CSCL 04A

The U.S. Environmental Protection Agency in cooperation with the U.S. Forest Service has established a network of air monitoring stations designed to measure levels of ozone in remote areas within the contiguous 48 states. There are currently eight sites, at various National Forests, which measure ozone, wind speed and direction, temperature, relative humidity, and solar radiation. This is a study of the network data gathered from 1976 through 1980 with analytical emphasis on the year 1979, for which the most complete meteorological and ozone records were available. The mean ozone level for 1979 at these sites fell within the range of 0.025 ppm to 0.04 ppm. At most sites, there were several days in 1979 when hourly concentrations of ozone exceeded 0.08 ppm. Examination of several individual days in 1979 with relatively high ozone levels using a back trajectory model showed that in almost all of these cases, the air had passed over large urban areas within the previous three days. The hypothesis is presented that high levels of ozone at remote sites may be due in part to the long range transport of ozone and/or its precursors. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N83-20472*# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
GEOPHYSICAL STUDY OF THE STRUCTURE AND PROCESSES OF THE CONTINENTAL CONVERGENCE ZONES: ALPINE-HIMALAYAN BELT Semiannual Status Report, 1 May 1980 - 31 Oct. 1981
M. Nafi Toksoz and Peter Molnar Feb. 1983 166 p refs
(Grant NAG5-41)
(NASA-CR-170019; NAS 1.26:170019; SASR-1-3) Avail: NTIS HC A08/MF A01 CSCL 08G

Studies of the structure of the continental collision zones using seismic and body waves, theoretical modelling of the thermal

regime of the convergence processes, and studies of earthquake mechanisms and deformation aspects of the model are covered. Author

N83-20473*# Analytical and Computational Mathematics, Inc., Houston, Tex. Computational Mechanics Service.
GRAVITATIONAL MODELS FOR MISSION PLANNING
Alan C. Mueller NASA. Johnson Space Center Dec. 1982 20 p refs
(Contract NAS9-16546)
(NASA-CR-167825; NAS 1.26:167825; JSC-18673; Rept-82-FM-65) Avail: NTIS HC A02/MF A01 CSCL 08N

A fitted truncated model is developed and any differences between this fitted model and one derived by simply truncating are analyzed. Based on the study, recommendations are made for an appropriate model for use in a mission planning environment. Author

N83-20474*# Computational Mechanics Consultants, Knoxville, Tenn.
JACCHIA-LINEBERRY UPPER ATMOSPHERE DENSITY MODEL
Alan C. Mueller Oct. 1982 46 p refs
(Contract NAS9-16546)
(NASA-CR-167824; JSC-18507; NAS 1.26:167824; Rept-82-FM-52) Avail: NTIS HC A03/MF A01 CSCL 04A

A series of increasingly accurate models which are a careful blend of empirical and theoretical formulae were developed. The exospheric temperature is assumed to be a function of: (1) the average and daily variations in the solar flux, (2) the average and three hourly variations in the geomagnetic index, (3) the angle between the position vector and the axis of the unsymmetric atmospheric bulge, and (4) the angle between the position vector and the geomagnetic pole. The exospheric temperature is related to the density by the solution of the diffusion equilibrium equations for the different constituents of the atmosphere as a function of altitude. Other variations are modeled directly as changes in the density. They are: (1) changes due to the semiannual effect, and (2) changes due to the seasonal latitudinal effect. The causes for these variations are not exactly known but may be modeled sufficiently by empirical formulae. The Jacchia model is assumed to be valid over the altitude range of 90 to 2500 km. The residuals between the observed density from satellite drag observations and the computed densities show the mean relative error to be generally less than 10 percent with occasional peak errors near 50 percent. S.L.

N83-20475# National Aeronautical Establishment, Ottawa (Ontario). Flight Research Lab.
THE FREQUENCY DIFFERENCE TRANSLATOR. AN IMPROVEMENT IN AIRBORNE TECHNIQUES FOR MEASURING THE EARTH'S TOTAL MAGNETIC FIELD GRADIENT
A. Barszczewski Sep. 1982 30 p refs
(LR-612; NRC-20654) Avail: NTIS HC A03/MF A01

Improvements in airborne techniques for the measurement of the Earth's total magnetic field gradient using optically pumped magnetometers are discussed. These techniques involve fast and accurate measurements of small frequency differences and are applicable to a large class of transducers which have for an output a frequency varying with the input variable. Description and design details are given of a newly developed analog instrument which allows a continuous read-out of frequency difference with a resolution of better than 0.01 Hz. Author

N83-20476# Ghana Univ., Legon. Dept. of Physics.
IONOSPHERIC RESEARCH USING SATELLITES Final Scientific Report, 1 Jun. 1980 - 31 May 1981
D. Yeboah-Amankwah and V. C. K. Kakane 1 Jul. 1982 26 p refs
(Grant AF-AFOSR-0001-80; AF Proj. 4643)
(AD-A122074; AFGL-TR-82-0359) Avail: NTIS HC A03/MF A01 CSCL 04/1

Equatorial scintillation on the 257MHz signals from Marisat 1 satellite during 1980 is reported. Scintillation index and depth of fade are the two parameters used in the analysis. Seasonal variations of scintillation and the correlation between scintillation and geomagnetic activity were examined. The results earlier confirm observations on the 136 MHz signals made at Legon (Koster, 1972). Except for a few differences, these results are similar to observations on 1.5 GHz made at Huancayo. Apart from May-August, scintillations are negatively correlated with geomagnetic activity in the remaining part of the annual cycle. Author (GRA)

N83-20477# Texas Univ., Austin.
FINITE ELEMENT MODELING OF COUPLES HEAT AND MOISTURE TRANSPORT IN PERMAFROST Final Report, 1 May 1979 - 31 Jul. 1982
G. F. Carey and L. J. Hayes Oct. 1982 7 p refs
(Contract DAAG29-79-C-0081)
(AD-A120931; ARO-16207.24-GS) Avail: NTIS HC A02/MF A01 CSCL 12/1

The purpose of this research was to investigate the use of finite element techniques for solving convective heat transfer problems which involve phase change. The specific application was to permafrost modeling..This has been accomplished at several levels, ranging from very theoretical error estimates and development of special numerical techniques to handle phase change, to application of finite element techniques to specific permafrost problems. GRA

N83-20478# National Aeronautical Establishment, Ottawa (Ontario).
THE FREQUENCY DIFFERENCE TRANSLATOR: AN IMPROVEMENT IN AIRBORNE TECHNIQUES FOR MEASURING THE EARTH'S TOTAL MAGNETIC FIELD GRADIENT
A. Barszczewski Sep. 1982 29 p refs
(AD-A121395; NAE-LR-612; NRC-20654) Avail: NTIS HC A03/MF A01 CSCL 17/6

Improvements in Airborne techniques for the measurement of the Earth's total magnetic field gradient using optically pumped magnetometers are discussed. These techniques involve fast and accurate measurements of small frequency differences and are applicable to a large class of transducers which have for an output a frequency varying with the input variable. Description and design details are given of a newly developed analog instrument which allows a continuous read-out of frequency difference with a resolution of better than 0.01 Hz. Author (GRA)

N83-20479# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Geotechnical Research Branch.
SUBSEA PERMAFROST IN HARRISON BAY, ALASKA: AN INTERPRETATION FROM SEISMIC DATA
K. Gerard Neave and Paul V. Sellmann Aug. 1982 65 p refs Sponsored in part by the Bureau of Land Management and the National Oceanic and Atmospheric Adminstration
(AD-A121020; CRREL-82-24) Avail: NTIS HC A04/MF A01 CSCL 08/12

Velocity data derived from petroleum industry seismic records from Harrison Bay show that high-velocity material (> or = 2 km/s) interpreted to be ice-bonded permafrost is common. In the eastern part of the bay, the depth to high velocity material increases and velocity decreases in an orderly manner with increasing distance from shore until the layer is no longer apparent. The western part of the bay is less orderly, possibly reflecting a different geological and thermal history. This western part may be an inundated section of the low coastal plain characterized by the region north of Teshekpuk Lake, and could have contained deep thaw lakes, creating low velocity zones. Along some seismic lines, the high-velocity material extends approximately 25 km offshore. Two anomalies have been found which could be associated with rapidly degrading permafrost. One is strong attenuation, which was interpreted as an indication of gas in the shallow deposits. The other is the presence of considerable seismic noise, including identifiable small seismic events. The origin of this noise has not been positively established, and it is proposed that it may indicate

that some movement is occurring in the sediments due to thaw.
GRA

N83-20480# Defense Mapping Agency Hydrographic and Topographic Center, Washington, D.C. Geodetic Survey Squadron.
RESULTS FROM A U.S. ABSOLUTE GRAVITY SURVEY
M. A. Zumberge, J. E. Faller, and J. Gschwind 1982 18 p refs Prepared in cooperation with NBS and the Joint Inst. for Lab. Astrophysics Submitted for publication
(AD-A121229) Avail: NTIS HC A02/MF A01 CSCL 08/5

Using the recently completed JILA absolute gravity meter, we made a survey of twelve sites in the United States. Over a period of eight weeks, the instrument was driven a total distance of nearly 20,000 km to sites in California, New Mexico, Colorado, Wyoming, Maryland and Massachusetts. The time spent in carrying out a measurement at a single location was typically one day. We report the results of the measurements in this survey along with earlier measurements made with the instrument, discuss the measurement accuracy and compare our results with other measurements. GRA

N83-20481# Air Force Geophysics Lab., Hanscom AFB, Mass. Aeronomy Div.
HIGH RESOLUTION STRATOSPHERIC WINDS FROM CHEMICAL SMOKE TRAIL EXPERIMENTS AT WHITE SANDS MISSILE RANGE AND WALLOPS ISLAND Interim Scientific Report
Antonio F. Quesada 30 Jul. 1982 49 p refs
(AF Proj. 6687)
(AD-A122174; AFGL-TR-82-0209; AFGL-ERP-785) Avail: NTIS HC A03/MF A01 CSCL 04/1

This report describes some recent improvements in the hardware and software used to measure photographic images of chemical smoke trails. It also presents measurements of winds and windshears for five experiments conducted at White Sands Missile Range and Wallops Island from 1973 to 1978. In addition, it discusses sources of error in the measurements and suggests means of reducing the errors to improve the vertical resolution of the wind and windshear profiles. GRA

N83-20482# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Snow and Ice Branch.
FLUID DYNAMIC ANALYSIS OF VOLCANIC TREMOR
M. G. Ferrick, A. Qamar, and W. F. St.Lawrence Oct. 1982 18 p refs
(DA Proj. 4A1-61102-AT-24)
(AD-A122778; CRREL-82-32) Avail: NTIS HC A02/MF A01 CSCL 20/4

Low-frequency (<10 Hz) volcanic earthquakes originate at a wide range of depths and occur before, during, and after magmatic eruptions. The characteristics of these earthquakes suggest that they are not typical tectonic events. Physically analogous processes occur in hydraulic fracturing of rock formations, low-frequency icequakes in temperate glaciers, and autoresonance in hydroelectric power stations. We propose that unsteady fluid flow in volcanic conduits is the common source mechanism of low-frequency volcanic earthquakes (tremor). The fluid dynamic source mechanism explains low-frequency earthquakes of arbitrary duration, magnitude, and depth of origin, as unsteady flow is independent of physical properties of the fluid and conduit. Fluid transients occur in both low-viscosity gases and high-viscosity liquids. A fluid transient analysis can be formulated as generally as is warranted by knowledge of the composition and physical properties of the fluid, material properties, geometry and roughness of the conduit, and boundary conditions. To demonstrate the analytical potential of the fluid dynamic theory, we consider a single-phase fluid, a melt of Mount Hood andeside at 1250 deg C, in which significant pressure and velocity variations occur only in the longitudinal direction. GRA

N83-20483# Stanford Univ., Calif. Dept. of Geophysics.
IMPROVEMENTS IN GEOTHERMOMETRY Final Technical Report
Jared Potter, Walter Dibble, George Parks, and Amos Nur Jul. 1982 63 p refs
(Contract DE-FC07-80ID-12147)
(DE83-001594; DOE/ID-12147/T1) Avail: NTIS HC A04/MF A01

Important assumptions underlying chemical geothermometers include: (1) temperature dependent water-rock reactions in the reservoir fix the absolute (silica) or relative concentrations of dissolved indicator constituents in the formation water, (2) the water and rock are at equilibrium with respect to the indicator reaction, (3) there is an adequate supply of each reactant, and (4) unless specifically accounted for, no reequilibration, mix or boiling occurs after the water leaves the reservoir en route to the sampling point. The Na-K-Ca geothermometer is based on assumed equilibrium among K, and Na, Ca aluminosilicates. The indicated reactions originally proposed can be summarized in one expression. DOE

N83-20484# Geological Survey, Menlo Park, Calif.
PRELIMINARY APPRAISAL OF GRAVITY AND MAGNETIC DATA AT SYNCLINE RIDGE, WESTERN YUCCA FLAT, NEVADA TEST SITE, NYE COUNTY, NEVADA
David A. Ponce and William F. Hanna 1982 21 p refs
(Contract DE-AI08-78ET-44802)
(DE83-001806; USGS-OFR-82-931) Avail: NTIS HC A02/MF A01

A gravity and magnetic study of the Syncline Ridge area was conducted as part of an investigation of argillite rocks of the Eleana Formation under consideration as a medium for the possible storage of high level radioactive waste. Bouger gravity anomaly, low level aeromagnetic anomaly, density, and magnetization data collectively indicate to the Eleana Formation, the principal target of the investigation: (1) in an area extending northwestward from Mine Mountain, through Syncline Ridge, to the Eleana Range, the Eleana Formation, where not exposed, occurs at depths of less than approx. 200 m, except for a small region of exposed older Paleozoic rocks; (2) in the region of shallowly buried Eleana Formation, occurrences of volcanic rock cover are delineated by low level aeromagnetic anomaly data, which also discriminate normally polarized from reversely polarized tuff units; and (3) selective detection of high quartz argillite relative to low quartz argillite using surface gravity data is not feasible if the high quartz and low quartz varieties are intimately interbedded, as observed in boreholes. DOE

N83-20485# Geological Survey, Menlo Park, Calif.
PRELIMINARY RESULTS OF GRAVITY INVESTIGATIONS AT YUCCA MOUNTAIN AND VICINITY, SOUTHERN NYE COUNTY, NEVADA
D. B. Snyder and W. J. Carr 1982 56 p refs
(Contract DE-AI08-78ET-44802)
(DE83-001725; USGS-OFR-82-701) Avail: NTIS HC A04/MF A01

Exploration for a high level nuclear waste-repository site in the Yucca Mountain area, Nevada, resulted in the addition of 423 new gravity stations during the past 2 years to the 934 existing stations to form the data base of this study. Surface rock samples, borehold gamma-gamma logs, and a borehold gravity study provide density control. A linear ncrease in density of 0.26 g/cm(3) per km is indicated in the tuff sequences makes the density contract across the basal contact of the tuff the only strong source of gravity fluctuations. The resulting residual gravity plot shows significant gravity anomalies that correlate closely with the structures inferred from drill hole and surface geologic studies. Gravity highs over the three Paleozoic rock outcrops within the study area served as reference points for the gravity models. At least 3000 m of tuff fills a large steep sided depression in the prevolcanic rocks beneath Yucca Mountain and Crater Flat. The gravity low and thick tuff section probably lie within a large collapse area comprising the Crater Flat Timber Mountain Silent Canyon caldera complexes. Gravity lows in Crater Flat itself are thought to coincide with the source areas of the Prow Pass Member, the Bullfrog Member, and the unnamed member of the Crater Flat Tuff. DOE

N83-20486# Bureau of Mines, Denver, Colo. Research Center.
SOFTWARE TECHNIQUES IN MICROSEISMIC DATA ACQUISITION
John P. Coughlin Aug. 1982 57 p refs
(PB83-111252; BM-RI-8691) Avail: NTIS HC A04/MF A01 CSCL 08I

Software techniques developed for real time microseismic data analysis are presented. These techniques focus on the simple acquisition of P wave arrival times and their use in event location. Software techniques to separate microseismic events from mining noise such as drilling and from very large events such as rock bursts are discussed. Incorporation of these techniques has enhanced the reliability and accuracy of computer based monitoring of microseismic activity in ongoing research. GRA

N83-20487# Southern Methodist Univ., Dallas, Tex. Dept. of Civil and Mechanical Engineering.
A STUDY OF POWER SPECTRAL DENSITY OF EARTHQUAKE ACCELEROGRAMS Ph.D. Thesis
Parviz Moayyad and Bijan Mohraz Jun. 1982 312 p refs
(Grant NSF PFR-80-04824)
(PB83-101014; NSF/CEE-82032) Avail: NTIS HC A14/MF A01 CSCL 08K

A time dependent power spectral density of recorded earthquake accelerograms was statistically estimated. The study assumes that the strong motion segments of accelerograms form a locally stationary random process whose members exhibit a time invariant frequency. The RMS values are correlated with a variable reflecting the four most commonly used design parameters peak ground acceleration, earthquake magnitude, epicentral distance, and the duration of strong motion. Such correlations will make it possible to estimate a power spectral density for a specific site annd earthquake parameters. The estimated power spectral densities are used to predict the response of a single degree of freedom system at several sites. Results are compared with spectral relative displacement, relative velocity, and absolute acceleration. Findings of the study support the viability of using the random vibration theory in earthquake resistant design of structures. GRA

N83-20488# National Academy of Sciences - National Research Council, Arlington, Va.
REPORT ON UNITED STATES ANTARCTIC RESEARCH ACTIVITIES, FEBRUARY 1981 - OCTOBER 1982; UNITED STATES ANTARCTIC RESEARCH ACTIVITIES PLANNED FOR OCTOBER 1982 - SEPTEMBER 1983. REPORT TO SCIENTIFIC COMMITTEE ON ANTARCTIC RESEARCH (SCAR)
Jun. 1982 84 p refs
(Grant NSF DPP-82-07098)
(PB83-100305; Rept-24) Avail: NTIS HC A05/MF A01 CSCL 04A

Information on U.S. Antarctic Research Program; projects completed from February 1981 to March 1982, those in progress from March 1982 to October 1982, and those planned for initiation from October 1982 through September 1983 is given. The nature and location of the research are described and principal investigators and sources of data and information are listed. GRA

N83-20489# Swedish Detonic Research Foundation, Stockholm.
FRACTURE TOUGHNESS TESTING OF ROCK, PART 2
Finn Ouchterlony 1 Jul. 1982 79 p refs Presented in CISM Lectures on Rock Fracture Mech., Udine, Italy, 5-8 Jul. 1982
(PB83-110908; DS-1982-5) Avail: NTIS HC A05/MF A01 CSCL 08G

The fracture toughness testing of rock was reviewed. Experimental and analytical work performed to develop core bend specimens is summarized. Experimental work with the obtain representative fracture toughness values from these specimens is presented. GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N83-20490*# FWG Associates, Inc., Tullahoma, Tenn.
TEST RESULTS OF MODIFIED ELECTRICAL CHARGED PARTICLE GENERATOR FOR APPLICATION TO FOG DISPERSAL Interim Report
Walter Frost and Kao-Huah Huang Washington NASA Feb. 1983 50 p refs
(Contract NAS8-34729)
(NASA-CR-3674; NAS 1.26:3674) Avail: NTIS HC A03/MF A01 CSCL 04B

Modifications to a charged particle generator for use in fog dispersal applications were made and additional testing carried out. The modified nozzle, however, did not work as planned, and reported results are the unmodified nozzle. The addition of a positive displacement pump to supply the liquid water was highly successful. Measurements of the generator output current were made with a cylindrical collector system as well as with the needle probe used in previous studies. Measurements with the cylindrical collector and the needle probe showed identical agreement within the variability of the experiment. A high-voltage prove was purchased, and measurements of the corona voltage as well as the voltage variation in the charged particle jet were made. Electric fields in the vertical direction on the order of 1,000,000 v/m were measured. The voltage distribution along the centerline of the jet was compared with the numerical solutions of the Poisson equation and showed very good agreement. Velocity measurements using a pitot tube were made. The resulting measurements were compared with theoretical and other reported experimental results. The measured data showed the appropriate trends and agreed well with reported results. Based on the measured current-to-mass ratio from the charged particle generator, a calculation of the average droplet size was made. Droplet sizes were estimated to range between 0.8 and 0.4 microns. Using measured data, an analysis of the height to which the droplet can be dispersed by the charged particle generator was made. Although the mathematical model is highly simplified, the results indicated that particles would achieve heights on the order of 80 m. Author

N83-20491# National Environmental Satellite Service, Kansas City, Mo. Satellite Field Services Station.
A TECHNIQUE FOR PREDICTING BACKDOOR THUNDERSTORM OUTFLOW BOUNDARIES
Samuel K. Beckman 1983 6 p refs
(Satellite-Appl-Info-Note-83/1) Avail: NTIS HC A02/MF A01

A technique which can alert the forecaster to the potential of westward moving thunderstorm outflow boundaries or arcs is introduced. In addition, some guidelines to estimate peak gusts with the arcs are presented. Although difficult to quantify, only larger outflow boundaries or arcs with lengths generally ranging from 100 to 200 miles, which travel for at least 100 miles during a 4 to 6 hour period are considered. In all cases, synoptic patterns are similar. A brief description of three cases is presented. A.L.

N83-20492# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
THE GENESIS AND DEVELOPMENT OF DEEP CONVECTIVE STORMS
P. C. Sinclair and J. F. W. Purdom (NOAA) Jan. 1983 61 p refs Sponsored by NOAA
Avail: NTIS HC A04/MF A01

Research aircraft flights were combined with rapid scan GOES imagery. The purpose of the research program was to provide a better understanding of the natural mechanisms that lead to the development of deep convective storms through integration and analysis of those special data sets. Data were taken during the field program with the goal of providing and indepth understanding of the fundamental mechanism, arc cloud line interactions, that lead to the development of deep convection. The experiment provided a unique data base from which the

convective storm's mesoscale flow field (dynamic and thermodynamic properties) could be documented by insitu measurements and near simultaneous GOES visible and infrared data. Several arc clouds were penetrated on three separate GOES rapid scan imaging days, and representative results from those penetrations are given in the text. It is hoped that the improvement in knowledge gained from this experiment will lead to a better understanding of mesoscale dynamics, which is of great importance for the development of improved short-range forecasting techniques.
Author

N83-20493# Committee on Science and Technology (U. S. House).
AVIATION WEATHER
Washington GPO 1982 219 p Hearing before the Subcomm. on Invest. and Oversight and the Subcomm. on Transportation, Aviation and Mater. of the Comm. on Sci. and Technol., 97th Congr., 2d Sess., 11 Aug. 1982
(GPO-98-983) Avail: Subcommittee on Investigations and Oversight

Accurate detection of weather around an airport and the most effective means of transmitting that information to a pilot are discussed. Giving weather sufficient priority, detection technology for such phenomena as wind shear, and corrollaries to wind shear such as downbursts that might hinder takeoff and landings. Author

N83-20494# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE AUTOMATIC METEOROLOGICAL STATION SYSTEM AN/TMQ-30 Final Report
William J. Vechione Aug. 1982 51 p ref
(AD-A121482; ERADCOM/ASL-TR-0112) Avail: NTIS HC A04/MF A01 CSCL 04/2

The NA/TMQ-30 Automatic Meteorological Station is a system consisting of a master station and 20 to 36 remote sensor stations. This system is designed to supplement surface observations within an Army division's zone of responsibility. The remote stations transmit, via digital radio frequency (RF) link, wind speed and direction, temperature, relative humidity, and pressure data to the master station. The Remotely Monitored Battlefield Sensor System (REMBASS) data transmission scheme is incorporated into the AN/TWQ-30. Transmission times are set hourly or half hourly, with a mission duration after deployment of 14 days. Microprocessor data control and processing are used throughout the system concept, both in the remote sensor stations and the master station. Currently, the system is in the advanced development stage. Hardware development was completed Jan. 81. Acceptance and operational test were accomplished between Feb. and May 81. These test included in plant acceptance, specification compliance, and operational capability test. Data collected were compared to calibrated standards. Presented are all tabulated and graphic representations, as well as field operation results. The results of the tests show the system's relative comparison with the standards. The future plans for system development are presented.
Author (GRA)

N83-20495# Naval Environmental Prediction Research Facility, Monterey, Calif.
A TECHNIQUE FOR PREDICTING SURFACE WIND DISTRIBUTIONS OF TROPICAL CYCLONES IN THE WESTERN NORTH PACIFIC Final Report
Ted L. Tsui, L. Robin Brody, and Samson Brand Oct. 1982 43 p refs
(W0513TA)
(AD-A122034; NEPRF-TR-82-05) Avail: NTIS HC A03/MF A01 CSCL 04/2

Accurate initial estimates and forecasts of radii of winds over 30 kt and 50 kt around tropical cyclones are important requirements for Navy decision-making and operations. This report describes a diagnostic study of tropical cyclone surface wind distribution that was conducted by using data extracted from tropical cyclone warnings issued by the Joint Typhoon Warning Center, Guam, during the period 1966-77. Results from two different data analyses show that: (1) The tangential wind speed along the radial axis decreases exponentially outward from the radius of maximum wind; (2) In addition to persistence, the change of a tropical cyclone's size depends only on the change of the maximum wind; and (3) The asymmetric shape of the isotachs correlates highly to the speed of movement. Based on these findings, a statistical wind-radius forecast model was formulated and tested on independent 1979 data. Results show that a time lag exists between the change of maximum wind and the change of wind radii, which suggests that the wind-pressure gradient adjustments may originate from the inner core of the storm and slowly propagate outward. The results also indicate that the statistical forecast model possesses a skill equal to that of an average JTWC forecaster's wind radius forecast.
Author (GRA)

N83-20496# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
CLIMATOLOGICAL FLUX ESTIMATES IN THE MEDITERRANEAN SEA. PART 1: WINDS AND WIND STRESSES Final Report
Paul W. May Oct. 1982 65 p refs
(Proj. F59557)
(AD-A121931; NORDA-54) Avail: NTIS HC A04/MF A01 CSCL 04/2

Climatological wind stress averages have been calculated for the entire Mediterranean Sea for one degree longitude squares. The individual stresses were estimated from ship observations of wind speed and wind direction using a quadratic law with variable drag coefficient. Individual stresses were averaged by month over the 20-year base period, 1950-1970, to obtain the climatology. Smoothed versions of the monthly wind stress estimates, appropriate for forcing numerical models, were also calculated. Wind stresses exhibit the major wind patterns that are well-known features of the Mediterranean circulation. The Mistral, Boro, and Etesian wind systems are the most evident of the area's features. The seasonal cycles, the curl, and the variance of the wind stresses are presented. Several interesting aspects of the relationship of the Mistral to the formation of bottom water in the Golfe du Lion region are discussed.
GRA

N83-20497# Ophir Corp., Denver, Colo.
THEORY, ELECTO-OPTICAL DESIGN, TESTING, AND CALIBRATION OF A PROTOTYPE ATMOSPHERIC SUPERSATURATION, HUMIDITY, AND TEMPERATURE SENSOR Final Report, Mar. 1981 - Jul. 1982
Loren D. Nelson Hanscom AFB, Mass. AFGL 15 Jul. 1982 117 p refs
(Contract F19628-81-C-0071; AF Proj. 6670)
(AD-A121713; AFGL-TR-82-0283) Avail: NTIS HC A06/MF A01 CSCL 04/2

A new infrared differential absorption - passive thermal emission based instrument designed to make accurate in-cloud measurements of absolute humidity, air temperature, relative humidity, and ice and water supersaturations has been developed. Absolute humidity is measured by the differential infrared absorption of a broad-band light beam between 2.45 microns wavelength and the strongly absorbing water vapor band at 2.67 microns. Air temperature is sensed by a passive radiometric measurement of the Planck's law radiance emitted by carbon dioxide molecules in their very intense emission band at 4.25 microns. Significant operational advantages over previous 14-16 micron band radiometers are achieved. These non-contact optical measurements of absolute humidity and true air temperature can then be combined to yield relative humidity values with respect to both water and ice which remain valid in condensing supersaturated conditions and in spite of hydrometeors in the sample volume.
Author (GRA)

N83-20498# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Statistics.
THE COMPARISON AND EVALUATION OF FORECASTERS
Morris H. DeGroot and Stephen E. Fienberg May 1982 26 p refs Presented at the Inst. of Statisticians Intern. Conf. on Practical Bayesian Statistics, Cambridge, England, 21-24 Jul. 1982
(Contract N00014-80-C-0637; Grant NSF SES-79-06386)

(AD-A121924; TR-244) Avail: NTIS HC A03/MF A01 CSCL 12/1

Methods are presented for comparing and evaluating forecasters whose predictions are presented as their subjective probability distributions of various random variables that will be observed in the future, e.g., weather forecasters who each day must specify their own probabilities that it will rain in a particular location. The concepts of calibration and refinement are reviewed. The relationship between this notion of refinement and the notion of sufficiency in the comparison of statistical experiments is described. We also consider the question of interrelationships among forecasters is considered. Attention is given to the concept of a proper scoring rule for evaluating forecasters, relating it to the concepts of calibration and refinement. Finally, conditions are discussed under which one forecaster can expioit the predictions of another forecaster to obtain a better score. B.W.

N83-20499# Air Force Geophysics Lab., Hanscom AFB, Mass. Meteorology Div.

EVALUATION OF SELECTED SENSORS FOR AUTOMATED TACTICAL WEATHER OBSERVATIONS Interim Scientific Report

Eugene Y. Moroz, Stuart J. Sheets, and James F. Morrissey 8 Jul. 1982 31 p refs

(AF Proj. 6670)

(AD-A122172; AFGL-TR-82-0191; AFGL-ERP-784) Avail: NTIS HC A03/MF A01 CSCL 04/2

A program was initiated at the Air Force Geophysics Laboratory to develop an automated system to provide accurate and timely measurements of temperature/dew point, winds, precipitation, pressure, visibility, and cloud height in a tactical bare-base airfield environment. An assessment was made of available meteorological sensors to determine their suitability to satisfy the requirements of such a system. Potential candidate sensors have been identified in all areas with the exception of visibility and cloud height. Under the current effort the following were completed: (1) translators were designed and built for AWS wind and temperature/dew point measuring sets in order to provide for automated operation; (2) intercomparison testing of a number of precipation gages was performed; (3) a hand-held laser rangefinder was evaluated for use as a cloud height measuring device; (4) a prototype tactical visibility meter (TVM) was designed, fabricated, and tested; and (5) the development of a preproduction version of the tactical visibility meter was initiated. GRA

N83-20500# Aeronautical Research Labs., Melbourne (Australia). Dept. of Mechanical Engineering.

MANUFACTURE OF A HOT WIRE TARGET ELEMENT FOR A CLOUD LIQUID WATER CONTENT METER

Neil J. Repacholi Mar. 1982 25 p refs

(AD-A122111; ARL/MECH-ENG-TM-412; AR-002-348) Avail: NTIS HC A02/MF A01 CSCL 04/2

An instrument has been developed to measure the liquid water content of artificially generated and naturally occurring icing clouds during ground and flight anti-icing trials of the Nomad N24 aircraft. This report describes the techniques employed in the manufacture of the hot wire target elements used in the liquid water content meter. Author (GRA)

N83-20501# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). SALINA MAP, KANSAS, PARTS A-F Final Report

20 Sep. 1982 500 p

(AD-A122720; AD-E850213; USAFETAC/DS-82/055) Avail: NTIS HC A21/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Salina MAP, Kansas. It contains the following parts: (1) Weather conditions; Atmospheric phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds, (4) Ceiling versus visibility, Sky cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperature and relative humidity); and (6) pressure Summary (means, standard, deviations, and observation counts of station pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N83-20502# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). LA CROSSE MAP, WISCONSIN, PARTS A-F Final Report

30 Jul. 1982 500 p

(AD-A122713; AD-E850206; USAFETAC/DS-82/047) Avail: NTIS HC A21/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for La Crosse Map, Wisconsin. It contains the following parts: (1) Weather conditions; Atmospheric phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus Visibility; Sky Cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperature and relative humidity); and (6) pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N83-20503# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). MANSFIELD/LAHM MAP, OHIO, PARTS A-F Final Report

3 Aug. 1982 500 p

(AD-A122714; AD-E850207; USAFETAC/DS-82/048) Avail: NTIS HC A21/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Mansfield/LAHM MAP, Ohio. It contains the following parts: (1) Weather conditions; Atmospheric phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus Visibility; Sky Cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperature and relative humidity); and (6) pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N83-20504# Pacific Northwest Lab., Richland, Wash.

WIND-SHEAR CLIMATOLOGY FOR LARGE WIND-TURBINE GENERATORS

D. L. Elliot, L. L. Wendell, and S. K. Heflick Oct. 1982 57 p refs

(Contract DE-AC06-76RL-01830)

(DE83-002883; PNL-4308) Avail: NTIS HC A04/MF A01

Climatological wind shear analyses relevant to the design and operation of multimegawatt wind turbines are provided. Insight is provided for relating the wind experienced by a rotating blade in a shear flow to the analysis results. A simple analysis of the wind experienced by a rotating blade for three types of wind shear profiles under steady state conditions is presented in graphical form. Comparisons of the magnitude and frequency of the variations in (1) the wind sensed by a single blade element, (2) the sum,

and (3) the difference of the winds sensed by opposite blade elements show strong sensitivity to profile shape. These three items represent forcing functions that can be related to (1) flatwise bending moment, (2) torque on the shaft, and (3) teeter angle. A computer model was constructed to simulate rotational sampling of 10 s sampled winds from a tall tower for three different types of large wind turbines. Time series produced by the model indicated that the forcing functions on a rotating blade vary according to the shear profile encountered during revolution as opposed to a profile derived from average wind conditions, e.g., hourly average winds. DOE

N83-20505# Texas Advisory Commission on Intergovernmental Relations, Austin.
MITIGATING DROUGHT THROUGH WEATHER MODIFICATION: SELECTED INSTITUTIONAL AND METEOROLOGICAL ISSUES IN TEXAS. VOLUME 1: TEXAS ADVISORY COMMISSION ON INTERGOVERNMENTAL RELATIONS Final Report, 15 Sep. 1980 - 1 Jun. 1982
Jay G. Stanford, Stan Kantrowitz, George Bomar, Bob Riggio, Donald R. Haragan, Dennis M. Driscoll, and Walter K. Henry May 1982 316 p refs Prepared in cooperation with the Texas Dept. of Water Resources 5 Vol.
(Contract DI-0-07-81-V0155)
(PB83-114801) Avail: NTIS HC A14/MF A01; also available in set of 5 reports HC E99 as PB83-114793 CSCL 04B

Selected institutional and meteorological issues for enhancing Texas' capability to mitigate drought through weather modification are discussed. Governments, climate, geography, and economy of the Edwards area of Central Texas are discussed as well as Texas statutory and case law, including the Texas Weather Modification Act, plus related statutes of other states. The Texas Disaster Act and the connections between disaster planning and drought are discussed. Intergovernmental rain augmentation responsibilities and alternative institutional approaches are discussed. Precipitation climatology, radar echo characteristics, and upper air studies are discussed. GRA

N83-20506# Texas Advisory Commission on Intergovernmental Relations, Austin.
MITIGATING DROUGHT THROUGH WEATHER MODIFICATION: SELECTED INSTITUTIONAL AND METEOROLOGICAL ISSUES IN TEXAS. VOLUME 2: RADAR ECHO CHARACTERISTICS IN THE EDWARDS PLATEAU-BALCONES ESCARPMENT AREA OF TEXAS Final Report, 15 Sep. 1980 - 1 Jun. 1982
Dennis M. Driscoll May 1982 59 p refs Prepared in cooperation with the Texas Dept. of Water Resources 5 Vol.
(Contract DI-0-07-81-V0155)
(PB83-114819) Avail: NTIS HC A04/MF A01; also available in set of 5 reports HC E99 as PB83-11793 CSCL 04B

The characteristics of rain cells (radar echoes) in the southern periods analyzed are divided according to whether the aspect considered was initial echo occurrence or all echo occurrence. The former comprises nine very rainy (wet) days, 98 vitually rainless (dry) days, and an additional 103 unclassified days. The latter comprises a total of 699 days, but only 372 of these were fully analyzed because of time constraints. All days are from the convective seasons (April to Sept.) of the years 1973 to 1980. GRA

N83-20507# Texas Advisory Commission on Intergovernmental Relations, Austin.
MITIGATING DROUGHT THROUGH WEATHER MODIFICATION: SELECTED INSTITUTIONAL AND METEOROLOGICAL ISSUES IN TEXAS. VOLUME 3: PRECIPITATION CLIMATOLOGY FOR THE EDWARDS PLATEAU REGION OF TEXAS Final Report, 15 Sep. 1980 - 1 Jun. 1982
Donald R. Haragan May 1982 75 p Prepared in cooperation with the Texas Dept. of Water Resources 5 Vol.
(Contract DI-0-07-81-V0155)
(PB83-114827) Avail: NTIS HC A04/MF A01; also available in set of 5 reports HC E99 as PB83-114793 CSCL 04B

A precipitation climatology of the Edwards Plateau region of Texas is presented and discussed. The area is characterized by maximum precipitation in May and September with minimum precipitation in winter and early spring. The spatial distribution of average annual precipitation shows an east-west bulge which is probably related to the abrupt rise in elevation along the Balcones Escarpment. Maps of mean monthly precipitation show evidence of topographic effects on several scales ranging from extremely localized to broad-scale features along the escarpment. During the warm season, rainfall occurs as scattered showers or thunderstorms characteristic of localized convection. Heavy precipitation in late summer and early fal is due to tropical activity moving west and north from the Gulf of Mexico. GRA

N83-20508# Texas Advisory Commission on Intergovernmental Relations, Austin.
MITIGATING DROUGHT THROUGH WEATHER MODIFICATION: SELECTED INSTITUTIONAL AND METEOROLOGICAL ISSUES IN TEXAS. VOLUME 4: AN OBJECTIVE STUDY OF THE UPPER-AIR CONDITIONS RELATING TO PRECIPITATION OVER THE SOUTHEASTERN SECTION OF THE EDWARDS PLATEAU Final Report, 15 Sep. 1980 - 1 Jun. 1982
Walter K. Henry, Tom Utley, and John Lipe May 1982 85 p refs Prepared in cooperation with the Texas Dept. of Water Resources 5 Vol.
(Contract DI-0-07-81-V0155)
(PB83-114835) Avail: NTIS HC A05/MF A01; also available in set of 5 reports HC E99 as PB83-114793 CSCL 04B

The upper air meteorological variables which are associated with rainfall over the southeastern portion of the Edwards Plateau in Texas are studied. Using the six summer months of eight years of data from these rawinsonde stations, eighteen parameters were computed for each observation period. These values were compared with the daily rainfall as reported by approximately eight rainfall stations within the triangle. Regression equations were formulated relating the eighteen parameters to the average areal rainfall amount. A method is presented to forecast the days (about 50% of the days) when no seedable rain will occur. GRA

N83-20509# Florida Univ., Gainesville. Dept. of Fruit Crops.
THE DEVELOPMENT OF NOCTURNAL GOES INFRARED DATA AS A SOURCE OF CLIMATE INFORMATION
Ellen Chen and J. David Martsolf Jun. 1982 123 p refs
(Grant NA80AA-D-00129)
(PB83-101253; NOAA-82062802) Avail: NTIS HC A06/MF A01 CSCL 04B

The major objectives of this project were to determine whether infrared digital data from the Geostationary Operational Environmental Satellite (GOES) could be used to delineate surface climate conditions, and if so, to develop applications for the GOES data. A winter nighttime data set for the Florida peninsula was chosen for analysis because these temperatures are often critical and detrimental to Florida's large citrus and winter crops. Results show that the GOES surface data can be used to delineate surface climate. The spatial density of the GOES data and the resolution is best studied for mesoscale area analysis. Data used in this study were infrared digital data collected from December 1976 to February 1981. GRA

N83-20510# National Severe Storms Lab., Norman, Okla.
NATIONAL SEVERE STORMS LABORATORY, FISCAL YEAR 1981 Annual Report, 1 Oct. 1980 - 30 Sep. 1981
Dec. 1981 50 p refs
(PB83-102293; NOAA-82062305) Avail: NTIS HC A03/MF A01 CSCL 04B

The report provides information on the organizational chart, personnel statistics, fiscal year 1982 funding, administration, research grants and contracts, publications and reports of the laboratory, personnel of the National Severe Storms Laboratory. The program areas described are: Meteorological research; Doppler radar and storm electricity research; Engineering support and development; Computing and data processing; and Cooperative Institute for Mesoscale Meteorological Studies. GRA

N83-20511# National Academy of Sciences - National Research Council, Arlington, Va.
MEETING THE CHALLENGE OF CLIMATE Final Report
Jul. 1982 78 p refs
(Contract NA79RA-C-00104)
(PB83-106443) Avail: NTIS HC A05/MF A01 CSCL 04B

The National Climate Program Act of 1978 authorized the establishment of programs of federal and state cooperative activities in climate studies and advisory services. The need for and potential benefits from cooperative activities are examined and documented. Examples of the utility of climate services are provided in the areas of agriculture, water resources, transportation and construction and energy. Provision of climate services by both public and private sector is considered. Recommendations are made for an effective nationwide system of climate services. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N83-20512*# Oregon State Univ., Corvallis. Climatic Research Inst.
NUMERICAL SIMULATION OF LARGE-SCALE OCEAN-ATMOSPHERE COUPLING AND THE OCEAN'S ROLE IN CLIMATE Final Technical Report, 1 May 1979 - 14 Dec. 1982
W. Lawrence Gates 10 Mar. 1983 65 p refs
(Grant NsG-5353)
(NASA-CR-170004; NAS 1.26:170004) Avail: NTIS HC A04/MF A01 CSCL 08J

The problem of reducing model generated sigma coordinate data to pressure levels is considered. A mass consistent scheme for performing budget analyses is proposed, wherein variables interpolated to a given pressure level are weighted according to the mass between a nominal pressure level above and either a nominal pressure level below or the Earth's surface, whichever is closer. The method is applied to the atmospheric energy cycle as simulated by the OSU two level atmospheric general circulation model. The results are more realistic than sigma coordinate analyses with respect to eddy decomposition, and are in agreement with the sigma coordinate evaluation of the numerical energy sink. Comparison with less sophisticated budget schemes indicates superiority locally, but not globally. Author

N83-20513# Naval Ocean Research and Development Activity, Bay St. Louis, Miss. Ocean Science and Technology Lab.
DOCUMENTATION OF SOFTWARE FOR THE NEIL BROWN INSTRUMENT SYSTEMS/NORDA VELOCITY/CTD PROFILER Final Report
K. D. Saunders and Henry Perkins Jul. 1982 65 p refs
(AD-A121498; NORDA-TN-155) Avail: NTIS HC A04/MF A01 CSCL 08/10

Software developed for processing Neil Brown Instrument Systems/NORDA profiler data is documented in this report. The software includes programs for translating the profiler data from original NBIS format to engineering units in UNIVAC/NAVOCEANO FEB files and for editing and correcting the data subsequently. This report provides complete descriptions of the programs as well as operating information. Author (GRA)

N83-20514# Scripps Institution of Oceanography, La Jolla, Calif.
ON THE USE OF BOREHOLES IN CONTROLLED ELECTROMAGNETIC SOURCE SOUNDINGS OF THE OCEAN CRUST
Alan D. Chave and Charles S. Cox Sep. 1982 39 p refs
(Contract N00014-75-C-0999)
(AD-A120949; SIO-REF-82-24) Avail: NTIS HC A03/MF A01 CSCL 08/7

In this report the theory of Chave and Cox (1982) is extended to the case where either the source or receiver is located in the oceanic crust, as in a borehole. Numerical calculations are presented which indicate that very little is gained by the use of boreholes unless low conductivity (< 0.005 S/m) material is penetrated for a significant distance, an unlikely occurrence unless the hole is deeper than 1500-2000 m. In particular, a VED source located in a borehole with receivers placed on the seafloor yields generally weaker signals than HED sources and receivers both located on the seafloor. A seafloor-based HED source with borehole receiver shows greater promise in terms of signal strength, however engineering limitations for this arrangement are more severe. GRA

N83-20515# Coastal Engineering Research Center, Fort Belvoir, Va.
DEPTH-LIMITED SIGNIFICANT WAVE HEIGHT: A SPECTRAL APPROACH
C. Linwood Vincent Aug. 1982 25 p refs
(AD-A120681; CERC-TR-82-3) Avail: NTIS HC A02/MF A01 CSCL 08/3

A theoretical equation that describes the region of a wind wave spectrum above the frequency of the spectral peak in a finite depth of water is used to develop a method for estimating depth-limited significant wave height. The theoretical background for the equation, along with supporting field and laboratory data, is given. The method indicates that significant wave height, defined as four times the standard deviation of the wave record, is approximately proportionally to the square root of the water depth. GRA

N83-20516# Office of Naval Research, Pasadena, Calif.
ARCTIC EXPENDABLE TECHNOLOGY
Ben J. Cagle Sep. 1982 56 p
(AD-A120703; ORNDETPAS-8) Avail: NTIS HC A04/MF A01 CSCL 08/10

This paper presents data about three facets of a recently-completed VLSI design containing 45000 transistors. The first set of data describes the mask-level features of the circuit, from which it is seen that almost all features have at least one small dimension. The second set of data analyzes the hierarchical cell structure used by the designers to specify the circuit. The measurements show that composite cells have a different structure from primitive cells, and that, outside of arrays, cells are rarely re-used. The third set of data concerns the usage of an interactive layout program during the circuit's design. In spite of the circuit's size, the most frequently invoked commands were all simple. GRA

N83-20517# Naval Research Lab., Orlando, Fla. Underwater Sound Reference Detachment.
THE DEVELOPMENT OF A HIGH-POWER, LOW-FREQUENCY UNDERWATER ACOUSTIC SOURCE FOR USE IN A DEEP-TOWED GEOPHYSICAL ARRAY SYSTEM Final Report
A. M. Young, A. C. Tims, and T. A. Henriquez 15 Nov. 1982 22 p refs
(AD-A121698; NRL-8633) Avail: NTIS HC A02/MF A01 CSCL 20/1

A high power, low frequency acoustic source in the form of a Helmholtz resonator, was developed for use in the deep ocean in a geophysical application. The development of the transducer was accomplished through the use of equivalent circuit analysis and the construction/evaluation of a scale model. The transducer was evaluated and performed well in the 250 to 500 Hz frequency range in both a shallow water acoustic measurements facility and in the ocean to depths of over 2000 m. GRA

N83-20518# Pacific-Sierra Research Corp., Los Angeles, Calif.
COMPARISON OF OBSERVED DATA AND GDEM/STANDARD OCEAN DATA. PART 1: VERTICAL TEMPERATURE, SALINITY AND SOUND SPEED PROFILES AT SIX SELECTED SITE LOCATIONS IN THE MEDITERRANEAN SEA Final Technical Report, Dec. 1980 - Sep. 1981
S. C. Daubin, Jr. and E. Hashimoto Bay St. Louis, Miss. Naval Ocean Research and Development Activity Dec. 1981 134 p refs
(Contract N00014-79-C-0310)
(AD-A121468; PSR-1130-Pt-1; NORDA-TN-154S-Pt-1) Avail:

NTIS HC A07/MF A01 CSCL 08/10

This report compares the results of the General Digital Environmental Model (GDEM), developed by Dr. T. Davis of the Naval Oceanographic Office (NOO), with observed data from 69 vertical profiles of seasonally averaged temperature, salinity, and sound speed at six locations. The six sites, all located in the Mediterranean Sea, are the Alboran Sea, the Tyrrhenian Sea, the Balearic Sea, the Strait of Sicily, the Ionian Sea, and the Levantine Sea. Evaluations of GDEM-derived temperature, salinity, and sound speed profiles were performed, considering location, season, and individual parameters. Author (GRA)

N83-20519# Science Applications, Inc., McLean, Va.
A MODEL OF VERTICAL DISPERSION OF INERTIAL WAVES IN THE UPPER OCEAN Final Report, Jan. - Aug. 1982
David M. Rubenstein Aug. 1982 76 p refs
(Contract N00014-82-C-0243)
(AD-A120951; SAI-83-861-WA; OPD-TR-82-033-01) Avail: NTIS HC A05/MF A01 CSCL 08/3

A linear model of the vertical dispersion of near-inertial waves is developed. A porosity distribution near the bottom of the computational domain minimizes bottom reflections, and simulates an ocean of infinite depth. The model is used to show that the vertical dispersion of near-inertial waves in the upper ocean is sufficient to account for the observed rapid decay of inertial oscillations in the surface layer. When the upper pycnocline is sufficiently peaked, a resonant frequency interference effect is predicted. This effect modulates the dissipation of surface layer inertial oscillations, and their magnitude after a storm need not decay monotonically. We look at deep-ocean observations taken during MILE, and find some suggestive evidence of this interference effect. We also compare model simulations with Baltic Sea observations made by KRAUSS (1981), and show that near-inertial waves reflect off the shallow (105 m) bottom within a few inertial periods after a storm. GRA

N83-20520# Science Applications, Inc., McLean, Va.
COHERENCE BETWEEN STRATIFICATION AND SHEAR IN THE UPPER OCEAN Technical Progress Report, Nov. 1980 - Apr. 1982
David M. Rubenstein, Fred C. Newman, and Richard Lambert, Jr. Sep. 1982 23 p refs
(Contract N00014-81-C-0075)
(AD-A120998; SAI-82-614-WA) Avail: NTIS HC A02/MF A01 CSCL 08/10

A number of mechanisms are known to be responsible for the interdependence of stratification and shear. These include interleaving, internal waves, and instabilities such as double diffusion and breaking internal waves. In the strongly stratified seasonal thermocline the shear behaves approximately as S2 is directly proportional to N2 (Grabowski, 1980). Patterson et. al. (1981) showed that N2 and S2 are better correlated over vertical scales of 30 meters or more. This calculation of cross coherence between simultaneous profiles of N2 and S2 was intended to investigate the possibility of a limiting vertical length scale below which the correlation of N2 and S2 is small or zero, and above which the correlation is good. On the basis of a limited data set (9 YVETTE profiles), N2 and S2 appear in general to be well correlated at wavelengths larger than about 5-10 meters, except in the presence of large vertical geostrophic shear. These results offer some further evidence that levels of shear activity may be inferred from stratification at scales down to about 10 meters. GRA

N83-20521# Science Applications, Inc., McLean, Va.
ANALYSIS OF SHEAR FROM OCEAN CURRENT METERS Technical Progress Report, Nov. 1980 - May 1982
David M. Rubenstein and Fred C. Newman May 1982 85 p refs
(Contract N00014-81-C-0075)
(AD-A121037; SAI-82-687-WA) Avail: NTIS HC A05/MF A01 CSCL 08/3

Current meter records obtained over 48 days from triangular arrray of three moorings located near 39 deg N, 70 deg W in 1970 are used to investigate the time-variability of vertical shear. Vertical resolution is limited to 20 meters, the separation of the current meters, within the depth interval between 12m and 72m from the surface. Vertical, horizontal and slant coherences were calculated, as well as frequency spectra. The shear is dominated by the near-inertial frequencies, and the corresponding amplitudes decay rapidly with depth. Evidence for downward (upward phase) propagation of the inertial shear is presented, and in addition, some evidence for nonlinear interactions between inertial and tidal motions were observed. Significant shear at semidiurnal frequencies was observed at this location due to interaction of the semidiurnal tide with the nearby continental slope. Author (GRA)

N83-20522# Woods Hole Oceanographic Institution, Mass. Dept. of Chemistry.
TRANSFORMATIONS OF CAROTENOIDS IN THE OCEANIC WATER COLUMN Ph.D. Thesis
Daniel James Repeta Nov. 1982 247 p refs
(Contract N00014-74-C-0262; Grants NSF OCE-79-25352; NSF OCE-81-18436; NR Proj. 083-004)
(AD-A121499; WHOI-82-46) Avail: NTIS HC A11/MF A01 CSCL 08/10

In an effort to understand the more general mechanisms and rates of pre-depositional reactions that transform organic matter, the types and relevant time scales of reactions that transform carotenoid pigments in the oceanic water column were studied. Suspended particulate matter collected from surface waters of Buzzards Bay, Massachusetts and the Peru upwelling system has a carotenoid distribution reflecting the phytoplanktonic source of the material. The carotenoid distribution of sediment trap samples collected in these same areas was dominated by transformation products. Fucoxanthin, the primary carotenoid of marine diatoms, typically constituted 77-100% of the total fucopigments in suspended particulate material. In sediment trap samples this pigment constituted only 4-85% of the total. The remaining 15-96% of the pigments consisted of the fucoxanthin transformations products: free alcohols (2-94%), dehydrates (0-6%), and opened epoxides (0-19%). Preliminary results suggest that carotenoid esters are hydrolyzed to free alcohols at a rate determined by the turnover of primary productivity. GRA

N83-20523# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Snow and Ice Branch.
EQUATIONS FOR DETERMINING THE GAS AND BRINE VOLUMES IN SEA ICE SAMPLES
Gordon F. N. Cox and Wilford F. Weeks Oct. 1982 15 p refs Sponsored in part by Shell Development Co., Dept. of Interior, Amoco Production Co., Arco Oil and Gas Co., Chevron Oil Field Research Co., Exxon Production Research Co., Gulf Research and Development Co. Mitsui Engineering and Shipbuilding Co., NSF, Sohio Petroleum Co., Texaco, DOE and U.S. Coast Guard
(AD-A122779; CRREL-82-30) Avail: NTIS HC A02/MF A01 CSCL 12/1

Equations are developed that can be used to determine the amount of gas present in sea ice from measurements of the bulk ice density, salinity and temperature in the temperature range of -2 to -30 C. Conversely these relationships can be used to give the density of sea ice as a function of its temperature and salinity, considering both the presence of gas and of solid salts in the ice. Equations are also given that allow the calculation of the gas and brine volumes in the ice at temperatures other than that at which the bulk density was determined. Author (GRA)

N83-20524# Naval Oceanographic Office, Bay St. Louis, Miss.
OCEANOGRAPHIC ANALYSIS MANUAL FOR ICAPS USERS
Gordon G. Angell and Lowell E. Webb Sep. 1982 43 p refs
(AD-A122691; NOO-RP-43) Avail: NTIS HC A03/MF A01 CSCL 08/10

This report is intended to acquaint Naval personnel having limited oceanographic training and experience with an approach to analysis of oceanographic data as applied to acoustic performance predictions. Special emphasis is placed on computer-

assisted techniques. The relationship of acoustics and water masses and ocean fronts provides background information for oceanographic analysis. Data requirements, services, and analyses are discussed. ODA, a computer-assisted analysis technique, is also introduced. Author (GRA)

N83-20525# National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
DISSOLVED METHANE CONCENTRATIONS IN THE SOUTHEAST BERING SEA, 1980 AND 1981 Data Report
Charles N. Katz, Joel D. Cline, and Kimberly Kelley-Hansen Jul. 1982 200 p refs
(PB83-112433; NOAA-DR-ERL-PMEL-6; NOAA-82092205) Avail: NTIS HC A09/MF A01 CSCL 08J

Tables summarizing dissolved methane concentrations in the Bering Sea are given. The purpose is to identify potential environmental impacts to marine resources prior to the leasing and development of offshore petroleum and gas. These data were collected to assess the spatial and seasonal distributions of methane in order to estimate Lagrangian space scales and the magnitude of diffusive transport processes. GRA

N83-20526# Texas A&M Univ., College Station. Annual Report, 1 Apr. 1981 - 31 Mar. 1982
GAS HYDRATES IN DEEP OCEAN SEDIMENTS
James M. Brooks, Leo A. Barnard, Denis A. Wiesenburg, and Mahlon C. Kennicut Jun. 1982 99 p refs
Avail: NTIS HC A05/MF A01 CSCL 08G

The composition, state, and origin of gas in marine sediments, with particular emphasis on gas hydrates are discussed. Gas samples were obtained for molecular and isotopic analysis. Gas samples were collected from the first successful deployment of a pressure core barrel (PCB) in a hydrate region. Two of the four PCB retrievals at in situ pressures suggested the presence of small amounts of gas hydrates. Compositional and isotopic measurements of gases from several points along the pressure decline curve indicated that: biogenic methane was the dominant gas; the percent of C3, i-C4, and CO2 degassed increased as the pressure declined; and excess nitrogen was present during initial degassing. The PCB gas also contained trace amounts of saturated, acyclic, cyclic, and aromatic C5-C14 hydrocarbons, as well as alkenes and tetrahydrothiophenes. GRA

N83-20527# National Ocean Survey, Rockville, Md.
TIDE TABLES 1983, HIGH AND LOW WATER PREDICTIONS, CENTRAL AND WESTERN PACIFIC OCEAN AND INDIAN OCEAN
1982 393 p refs
(PB83-112268; NOAA-82090801) Avail: NTIS HC A17/MF A01

Tide tables for the central and western Pacific Ocean and Indian Ocean contains full daily predictions for 74 reference stations and differences and other constants for about 1900 stations. Included is a table for obtaining the approximate height of the tide at any time; a table of local mean time of sunrise and sunset for every fifth day of the year for different latitudes; a table for the reduction of local mean time to standard time; a table for converting feet to meters; a table of the Greenwich mean time of the Moon's phases, apogee, perigee, greatest north and south and zero declination; and the time of the solar equinoxes and solstices and a glossary of terms. GRA

N83-20528# Geological Survey, Albany, N.Y. Water Resources Div.
FLOW MODEL OF THE HUDSON RIVER ESTUARY FROM ALBANY TO NEW HAMBURG, NEW YORK Final Water Resources Investigations, 1977 - 1981
David A. Stedfast 1982 78 p refs Sponsored in cooperation with New York State Dept. of Environmental Conservation and New York City Dept. of Environmental Protection
(PB83-110007; USGS/WRI-81-55; USGS/WRD/WRI/82-068) Avail: NTIS HC A05/MF A01 CSCL 08C

A one dimensional transient flow simulation model was developed to represent a 76 mile reach of the tidal Hudson River between Albany and New Hamburg. The direction of flow reverses four times daily as a result of tidal influence; this produces complex current patterns and retards the rate at which the river can flush out pollutants. The reach studied is treated as two subreaches to incorporate differences in channel conditions and to simplify model calibration. All stage (water level) and discharge data were used to calibrate and verify the model and compare the model results with measured data. The model was used to calculate instantaneous stage, velocity, and discharge for any location in the reach and was used to calculate net volume flux between tide reversals. GRA

N83-20529# National Ocean Survey, Rockville, Md. Office of Program Development and Management.
NATIONAL OCEAN SURVEY Annual Report, Fiscal Year 1981
Jul. 1982 75 p refs
(PB83-101840; NOAA-81083001) Avail: NTIS HC A04/MF A01 CSCL 08J

The National Ocean Survey (NOS) is a major program element of the National Oceanic and Atmospheric Administration (NOAA) with the U.S. Department of Commerce. This report details the activities of NOS from October 1, 1980 through September 30, 1981. The major components are Office of the Director, National Geodetic Survey, Oceanography, Marine Surveys and Maps, Aeronautical Charting and Cartography, Program Development and Management, Marine Operations, Atlantic Marine Center, and Pacific Marine Center. GRA

N83-20530# National Ocean Survey, Rockville, Md.
TIDE TABLES, 1983. HIGH AND LOW WATER PREDICTIONS FOR EUROPE AND WEST COAST OF AFRICA INCLUDING THE MEDITERRANEAN SEA
1982 211 p
(PB83-110379; NOAA-82080610) Avail: NTIS HC A10/MF A01 CSCL 08C

The Tide Tables for Europe and West Coast of Africa which contain full daily predictions for 37 reference stations and differences and ranges for about 1,000 stations is presented. The following items are included: a table to obtain the approximate height of the tide at any time, a table of local mean time of sunrise for every fifth day of the year for different lattitudes, a table for the reduction of local mean time to standard time, a table for converting feet of the Moon's phases, apogee, perigee, greatest north and south and zero declination, and the time of the solar equinoxes and solstices, and a glossary of terms. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N83-20531# Michigan State Univ., East Lansing. Dept. of Biomechanics.
MECHANICAL PROPERTIES OF LOWER LIMB TENDONS AND LIGAMENTS IN PRIMATES
Daniel J. Selke, Robert William Little, Robert P. Hubbard, and Arnold R. Slonim Wright-Patterson AFB, Ohio Aerospace Medical Research Labs. Jul. 1982 32 p refs
(Contract F33615-79-C-0514; AF Proj. 7231)
(AD-A120797; AFAMRL-TR-82-56) Avail: NTIS HC A03/MF A01 CSCL 06/19

This report covers a study of the material property characteristics of four ligaments and tendons from the lower limbs of primates and is part of a three year study of the mechanical properties of soft connective tissues. The mechanical properties of the medial, collateral, and patellar ligaments of the knee and the flexor hallucis longus and tendo-calcaneus tendons of the ankle of the rhesus monkey, baboon, and chimpanzee were tested. The mechanical test program included establishment of initial tissue geometry, relaxation, constant strain rate, hysteresis, and cyclic relaxation tests. Long term preconditioning stability was monitored throughout the test program. Information on the mechanical properties of the

ligaments and tendons is essential to the understanding of injuries that result from escape and crash episodes. Different primate species data will aid in the selection of animal models and interspecies scaling techniques. GRA

N83-20532# Kansas Univ., Lawrence.
MOLECULAR CHARACTERISTICS OF MEMBRANE GLUTAMATE RECEPTOR-IONOPHORE INTERACTION Final Report
Hsuan Hung Chang and Elias K. Michaelis 15 Oct. 1982 23 p refs
(Contract DAAG29-79-C-0156)
(AD-A121373; ARO-16583.4-LS; Rept-7) Avail: NTIS HC A02/MF A01 CSCL 06/1

The excitatory responses produced in mammalian central nervous system neurons and in invertebrate muscles by the action of L-glutamic acid and L-aspartic acid are apparently the result of a glutamate- or aspartate-induced increase in membrane conductance of Na+. In our studies, we have used rat brain synaptosomal and synaptic membrane vesicular preparation to study this process. The synaptosomes and resealed synaptic plasma membrane vesicle preparations from brain tissue are thought to consist largely of presynaptic membrane sacs and of a few postsynaptic membrane vesicles. These plasma membrane fractions apparently retain a high degree of functional and structural integrity. In our laboratory, we have shown that these neuronal plasma membrane subfractions are enriched in glutamic acid binding sites. GRA

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N83-20533* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 238)
Nov. 1982 166 p
(NASA-SP-7011; NAS 1.21:7011(238)) Avail: NTIS HC $7.00 CSCL 06E

This bibliography lists 583 reports, articles and other documents introduced into the NASA scientific and technical information system in October 1982. Author

N83-20534*# State Univ. of New York, Buffalo. Div. of Cell and Molecular Sciences.
IMMOBILIZATION/REMOBILIZATION AND THE REGULATION OF MUSCLE MASS Status Report, 1 Nov. 1982 - 1 Apr. 1983
Richard R. Almon 1 Apr. 1983 4 p
(Grant NAG2-211)
(NASA-CR-169995; NAS 1.26:169995) Avail: NTIS HC A02/MF A01 CSCL 06P

The relationship between animal body weight and the wet and dry weights of the soleus and EDL muscles was derived. Procedures were examined for tissue homogenization, fractionation, protein determination and DNA determination. A sequence of procedures and buffers were developed to carry out all analyses on one small muscle. This would yield a considerable increase in analytical strength associated with paired statistics. The proposed casting procedure which was to be used for immobilization was reexamined. Author

N83-20535# Naval Submarine Medical Research Lab., Groton, Conn.
BIOCHEMICAL COMPARISONS OF TWO-HOUR EXPOSURES TO HYDROGEN-OXYGEN, HELIUM-OXYGEN AND NITROGEN-OXYGEN ATMOSPHERES AT 200 FSWG Interim Report
D. V. Tappan, E. Heyder, M. J. Jacey, and R. O. Madden 23 Sep. 1982 17 p refs
(AD-A121536; NSMRL-829) Avail: NTIS HC A02/MF A01 CSCL 06/19

Biochemical and hematologic analyses were performed on urine blood samples collected from three civilian divers following exposure for 120 minutes to hydrogen-oxygen, helium-oxygen and nitrogen-oxygen breathing mixtures at simulated pressures of 200 feet of sea water (FSWG). Normoxic environments were maintained except when symptoms of hypoxia, which developed in the subjects breathing nitrogen-containing mixtures, were relieved by additional oxygen. Biological sampling was possible from selected dives during a series of two dives by each subject in each of the gaseous mixtures. An overall evaluation of the biochemical and hematologic signs of stress point to no greater or somewhat reduced stress in divers breathing hydrogen-oxygen compared to helium-oxygen mixtures. Greatest differences were noted during the earlier phases of recovery from the dives. Measurable biological changes as a result of nitrogen-oxygen diving were confounded by outward signs of distress such as nausea and increased frequency of decompression sickness. Biochemical data lend support to the general medical observation of biological safety of hydrogen-oxygen mixtures under the conditions tested. The potential advantage of decreased density and greater availability of hydrogen compared to helium indicate that further testing of hydrogen-containing atmospheres is warranted. GRA

N83-20536*# Management and Technical Services Co., Houston, Tex.
MATHEMATICAL MODELS OF PHYSIOLOGICAL SYSTEMS Final Report, 22 Oct. 1980 - 1 Dec. 1982
R. J. White 1 Dec. 1982 90 p refs
(Contract NAS9-16328)
(NASA-CR-167821; NAS 1.26:167821) Avail: NTIS HC A05/MF A01 CSCL 06P

Calcium/musculoskeletal, cardiovascular, erythropoieses, and fluid and electrolyte/renal regulation are discussed. Modeling and software development are also discussed. Author

N83-20537# Committee on Science and Technology (U. S. House).
HEALTH INFORMATION SYSTEMS
Jane Bortnick and Kenneth Bogen Washington GPO 1983 27 p Presented to the Subcomm. on Sci., Res. and Technol. and the Subcomm. on Natural Resources, Agr. Res. and Environ. of the Comm. on Sci. and Technol., 97th Congr., 2d Sess., Dec. 1982 Prepared by the Library of Congr., Congr. Res. Serv.
(GPO-12-973) Avail: US Capitol, House Document Room

The utility of health information systems, elements necessary for a useful coordinated health information system (CHIS), problems of existing health data collection activities, problems associated with implementing a CHIS, and possible approaches to a CHIS are discussed. Author

N83-20538*# Wisconsin Univ., Madison. Bone Mineral Lab.
SKELETAL AND BODY COMPOSITION EVALUATION Final Report
Richard B. Mazess Mar. 1983 86 p refs
(Grant NAG2-166; NGR-50-002-051)
(NASA-CR-166465; NAS 1.26:166465) Avail: NTIS HC A05/MF A01 CSCL 06P

Research on radiation detectors for absorptiometry; analysis of errors affective single photon absorptiometry and development of instrumentation; analysis of errors affecting dual photon absorptiometry and development of instrumentation; comparison of skeletal measurements with other techniques; cooperation with NASA projects for skeletal evaluation in spaceflight (Experiment MO-78) and in laboratory studies with immobilized animals; studies of postmenopausal osteoporosis; organization of scientific meetings and workshops on absorptiometric measurement; and development of instrumentation for measurement of fluid shifts in the human body were performed. Instrumentation was developed that allows accurate and precise (2% error) measurements of mineral content in compact and trabecular bone and of the total skeleton. Instrumentation was also developed to measure fluid shifts in the extremities. Radiation exposure with those procedures is low (2-10 MREM). One hundred seventy three technical reports and one hundred and four published papers of studies from the University of Wisconsin Bone Mineral Lab are listed. B.G.

N83-20539*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ION BEAM SPUTTER ETCHED VENTRICULAR CATHETER FOR HYDROCEPHALUS SHUNT Patent Application
Bruce A. Banks, inventor (to NASA) Filed 24 Nov. 1982 13 p (NASA-Case-LEW-13107-2; US-Patent-Appl-SN-444124) Avail: NTIS HC A02/MF A01 CSCL 06B

An improved cerebrospinal fluid shunt in the form of a ventricular catheter for controlling the condition of hydrocephalus by relieving the excessive cerebrospinal fluid pressure is described. Method for fabricating the catheter and shunting the cerebral fluid from the cerebral ventricles to other areas of the body was improved. The obstruction of cerebrospinal fluid flow pathways or its inadequate absorption via the arachnoid villi into the venus blood of the brain results in hydrocephalus. Surgical correction involves pressure controlled shunting of the cerebrospinal fluid. The shunt will fail to function if the inlet ventricular catheter apertures become blocked. Shunt flow failure also occurs if 15 the ventricle collapses due to improper valve function causing over drainage. The ventricular catheter comprises a multiplicity of inlet microtubules. NASA

N83-20540# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
METHOD FOR THE QUANTITATIVE DETERMINATION OF THE MINERAL SALT CONTENT OF BONES USING RADIOACTIVE ISOTOPES
J. Rassow and H. Struter 22 Oct. 1982 6 p Transl. into ENGLISH of German Patent no. 2004155 (12 Aug. 1971) p 1-8
(AD-A122018; FTD-ID(RS)T-1372-82) Avail: NTIS HC A02/MF A01 CSCL 07/2

A method for the quantitative determination of the mineral salt content of bones using radioactive isotopes is described. Two measurements of radioactive isotope attenuation of different photon energies are outlined. GRA

N83-20541# National Academy of Sciences - National Research Council, Washington, D. C. AD Hoc Committee on Polar Biomedical Research.
POLAR BIOMEDICAL RESEARCH, AN ASSESSMENT. APPENDIX: POLAR MEDICINE, A LITERATURE REVIEW Final Report, Nov. 1980 - Sep. 1982
Frederick C. Koerner Oct. 1982 94 p refs
(Contract DAMD17-81-C-1012; DA Proj. 3M1-61102-BS-10)
(AD-A120696) Avail: NTIS HC A05/MF A01 CSCL 06/5

The study on polar biomedical research was undertaken by the Ad Hoc Committee on Polar Biomedical Research. Its objectives were to examine and summarize current knowledge of the medical aspects of life in polar regions and to consider research needs in relation to the expected increase in human populations in these areas as a result of growing economic, scientific, and military activities. This Appendix to the report of the Committee reviews the current level of understanding in polar biomedicine, lists more than 700 references, and provides background for the discussion, conclusions, and recommendations in the Committee's report. The Committee believes that it will be a useful resource for administrators, researchers, providers of health care services, and others concerned with human health in polar regions. Author (GRA)

N83-20542# School of Aerospace Medicine, Brooks AFB, Tex.
SOME BIOCHEMICAL INDICES OF MILD PHYSICAL STRESS: A PRELIMINARY STUDY Final Report, Oct. 1980 - May 1981
James P. Ellis, Jr., David C. Reader, Joseph R. Fischer, Jr., and Dorothy F. Wease Sep. 1982 12 p refs
(AF Proj. 7930)
(AD-A120708; SA-TR-82-33) Avail: NTIS HC A02/MF A01 CSCL 06/19

Toward establishing an analytical capability for quantifying the physical demands of job stress, the effectiveness of an experimental protocol was ascertained in a group of healthy men. The protocol featured measurement of epinephrine (E), norepinephrine (NE), and cortisol in blood drawn moments before and after 3 discrete levels of treadmill exercise. An added feature was testing of subjects with differing degrees of physical fitness (as adjudged by exercise habits). Although ways of enhancing the protocol's effectiveness were identified, the following definitive findings emerged: (1) plasma NE concentrations were the most sensitive to workload and differentiated fitness subgroups, (2) plasma E levels were slightly less sensitive to workload and did not differentiate as well fitness subgroups, and (3) evidence of adrenocortical stimulation was found only at the highest exercise level, and only for the less fit subjects. Exercise-induced changes in plasma NE correlated well ($r=0.861$) with concomitant changes in blood lactate (reported elsewhere), suggesting the 2 indices might collectively distinguish physical from cognitive or emotional demands in various work environs. GRA

N83-20543# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
NEW TECHNIQUES FOR MEASURING SINGLE EVEN RELATED BRAIN POTENTIALS Interim Report, 1 Apr. 1981 - 30 Mar. 1982
C. D. McGillem and J. I. Aunon 1 Sep. 1982 16 p
(Grant AF-AFOSR-0152-80; AF Proj. 2313)
(AD-A120474; AFORS-82-0901TR) Avail: NTIS HC A02/MF A01 CSCL 06/16

Alternative methods of selecting features of visual evoked potentials for automatic pattern classification are compared. Forward sequential feature selection with linear and quadratic discriminant functions, step-wise linear discriminant analysis and exhaustive enumeration with a linear discriminant function are considered. It is found that exhaustive enumeration provides a moderate improvement over the other procedures. In many cases the optimum set of features selected for a given size set does not contain the same features that were found optimum in a set having a different number of features. A new class of filters has been developed for processing evoked potentials that provides much greater discrimination against the ongoing EEG than other filters that have been employed. The filter incorporates all deterministic and statistical information about the signal and noise into a matrix operator that processes the measured data vector. Typical results are shown. A study of the effects of the ongoing EEG on measurement of the latency of evoked potential components is described. The results of the study indicate that the majority of the latency variations found experimentally are intrinsic to the evoked potentials themselves and do not result from interference by the ongoing EEG. GRA

N83-20544# Ohio State Univ., Columbus. Dept. of Engineering Mechanics.
MODELING OF HUMAN JOINT STRUCTURES Final Report, Jan. 1978 - Jun. 1981
Ali Erkan Engin and Manssour H. Moeinzadeh Wright-Patterson AFB, Ohio AFAMRL Sep. 1982 180 p refs
(Contract F33615-78-C-0510; AF Proj. 2312)
(AD-A121076; AFAMRL-TR-81-117) Avail: NTIS HC A09/MF A01 CSCL 06/19

Dynamic simulation of the response of the total human body to external forces provides essential information for prediction of injury and subsequent design and development of crash protection systems. The research program presented in this report is concerned with mathematical modeling of an articulating joint defined by the joint contact surfaces of two body segments and the joint ligaments. A rather extended discussion of the articulations and anatomical descriptions of the elbow, shoulder, hip, knee and ankle joints are first presented, with special emphasis on the location and functional aspects of the major ligaments of each joint. This is followed by a description of the articulating surfaces and the development of a measurement technique for the determination of articulating surface equations for the elbow, hip, knee and ankle joints. Next, a constitutive equation representing ligament characteristics and behavior is presented and the attachment sites of the ligaments of the elbow, hip, knee and ankle joints are provided. General two and three dimensional mathematical dynamic models of an articulating joint are then developed to determine the nature of motions and forces between

two body segments. The results are compared with experimental data from the literature and the validity of the model is established. GRA

N83-20545# Mason (Virginia) Research Center, Seattle, Wash.
DIFFERENCES IN TRANSIENT AND STEADY STATE ISOBARIC COUNTERDIFFUSION Final Report, 1 Sep. 1978 - 30 Aug. 1981
Brian G. DAoust, R. White, H. Swanson, R. Dunford, and J. Mahoney 19 Jul. 1982 65 p refs
(Contract N00014-78-C-0749)
(AD-A121315) Avail: NTIS HC A04/MF A01 CSCL 06/19

Recent studies demonstrated the interpretive difficulty associated with decompression experiments and the advantages associated with isobaric experiments involving either transient or steady-state counter-techniques. A very pronounced periodicity in numbers of bubbles with time following a gas switch which is as yet unexplained but may be most easily accounted for on the basis of periodic blood flow changes linked with other natural cycles. Periods appear to range in time from 40-90 minutes, and may be due to simple factors such as bubbles building up and sticking in areas of sluggish venous flow and then being released over a period of several minutes. Finally, perspectives for future work in this area are very encouraging in that our results confirmed and extended our previous work and have suggested that combined experiments where a given area of skin is masked with an ability to pass helium over it and combined with breathing a more soluble gas (such as nitrous oxide) to produce central venous bubbles. Author

N83-20546# Undersea Medical Society, Bethesda, Md.
MAN IN THE COLD ENVIRONMENT. A BIBLIOGRAPHY WITH INFORMATIVE ABSTRACTS. UPDATED VERSION
Charles W. Shilling, Pixie Story, Edward Podolak, and Christopher Rogers 1 Sep. 1982 366 p
(Contract N00014-82-K-0180)
(AD-A121441; UMS-PUB-57(CE-3)) Avail: NTIS HC A16/MF A01 CSCL 06/5

The scope of the literature search was directed toward military applications, particularly those dealing with cold injury, adaptation, therapeutic drugs, and rewarming techniques. Clinical and laboratory findings and applicable case histories dealing with the subject of hypothermia in general are included because of their pertinency to the understanding of the problems in treating hypothermic victims. GRA

N83-20547# Aerospace Medical Div., Brooks AFB, Tex. Plans Div.
AIR FORCE TECHNICAL OBJECTIVE DOCUMENT, AEROSPACE MEDICAL DIVISION, FISCAL YEAR 1984 Final Report
David C. Beatty and Larry H. Shingler Dec. 1982 46 p
(AD-A122696; AMD-TR-82-1; AMD-TR-81-1) Avail: NTIS HC A03/MF A01 CSCL 06/20

This TOD describes the planning methodology used within AMD laboratories' eight technology areas to achieve our technical goals. Specifically, efforts are directed in the biotechnology program to man's adaptability, survivability, and performance capabilities within his operational environment. This research and development of AMD's functions is accomplished as disciplinary work by teams of biomedical scientists, engineers and physical scientists within the Air Force laboratories and the industrial and academic research and development communities. Author (GRA)

N83-20548# Oak Ridge National Lab., Tenn.
NUCLEAR MEDICINE TECHNOLOGY Progress Report, quarter ending 30 Sep. 1981
F. F. Knapp, Jr. Feb. 1982 24 p refs
(Contract W-7405-eng-48)
(DE82-011300; ORNL/TM-8123) Avail: NTIS HC A02/MF A01

A new tellurium fatty acid analog, 15-penyl-6[/sup 123m/Te]tellurapentadecanoic acid, was synthesized and evaluated to determine the effect of the terminal phenyl group on myocardial uptake in rats. This new agent shows rapid and pronounced myocardial uptake and unique myocardial retention. The goal of these studies is the development of a tellurium fatty acid labeled with iodine-123 that would be useful to evaluate regional fatty acid metabolism. The /sup 123m/Te-labeled telluraheptadecanoic acid (THDA) analogs 12-THDA and 13-THDA were prepared and evaluated in rats. Both of these analogs show lower heart uptake and significantly decreased heart:blood and heart:lung ratios than the parent compound, 9-THDA. A re-evaluation of 11-[/sup 123m/Te]-THDA indicated that this analog showed significant myocardial uptake analogous to 9-THDA. These results indicate that tellurium in position-12 or -13 of THDA has a special effect on the mechanism of myocardial uptake. DOE

N83-20549# Bureau of Radiological Health, Rockville, Md.
AN OVERVIEW OF ULTRASOUND: THEORY, MEASUREMENT, MEDICAL APPLICATIONS, AND BIOLOGICAL EFFECTS Final Report
Harold F. Stewart and Melvin E. Stratmeyer Jul. 1982 147 p refs
(PB83-111583; DHHS/PUB-FDA-82-8190; FDA/BRH-82-76) Avail: NTIS HC A07/MF A01 CSCL 06F

Medical ultrasound in the United States is discussed. Background information on characteristics and interaction of ultrasound with matter, measurement of ultrasound fields, and medical applications of ultrasound is given. The potential biological effects of ultrasound in humans and experimental animals and the possible mechanisms for producing these effects are discussed. The potential risk to public health is evaluated and recommendations are made for the safe use of this modality. Recommendations are also made for further research to help clarify the potential biological risk associated with this rapidly growing modality. Author (GRA)

N83-20550# Thermo Electron Corp., Waltham, Mass.
RESEARCH AND DEVELOPMENT SYSTEMS FOR TRANSMITTING ENERGY THROUGH INTACT SKIN Annual Report, Apr. 1981 - Mar. 1982
C. Sherman, B. Daly, K. Dasse, W. Clay, M. Szycher, C. Battersby, J. Handrahan, J. Schuder, M. Lewis, and M. Worthington Apr. 1982 131 p refs Sponsored by National Heart and Lung Inst.
(PB83-109934; TE4285-264-82; NIH-N01-HV-0-2903-2) Avail: NTIS HC A07/MF A01 CSCL 06O

In vivo and in vitro evaluations of the prototype transcutaneous transformer were completed. Based on the results, a second generation transformer was developed and in vivo testing was begun. GRA

N83-20551# Office of Technology Assessment, Washington, D.C.
STRATEGIES FOR MEDICAL TECHNOLOGY ASSESSMENT
Sep. 1982 230 p refs
(PB83-113274; OTA-H-181) Avail: NTIS HC A11/MF A01 CSCL 06L

The present system of identifying and testing medical technologies and of synthesizing and disseminating assessment information is analyzed. The report focuses on the flow of information that is central to an efficient assessment system. Methods for testing technologies and for synthesizing information are explored, and a compendium of data and bibliographic sources are included. The report also describes the innovation process for medical technologies, the effects that Federal policies have on that process, and the needs those policies generate for technology assessment information. It critiques the current system of assessment and provides policy options, both legislative and oversight, for Congress to improve the system. GRA

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N83-20552*# Old Dominion Univ., Norfolk, Va.
THE EFFECTIVENESS OF INCORPORATING A REAL-TIME

OCULOMETER SYSTEM IN A COMMERCIAL FLIGHT TRAINING PROGRAM Final Report
Dennis H. Jones, Glynn D. Coates, and Raymond H. Kirby Washington NASA Mar. 1983 43 p refs
(Contract NCC1-57)
(NASA-CR-3667; NAS 1.26:3667; Rept-82-613) Avail: NTIS HC A03/MF A01 CSCL 05I

The effectiveness of incroporating a real-time oculometer system into a Boeing 737 commercial flight training program was studied. The study combined a specialized oculometer system with sophisticated video equipment that would allow instructor pilots (IPs) to monitor pilot and copilot trainees' instrument scan behavior in real-time, and provide each trainee with video tapes of his/her instrument scanning behavior for each training session. The IPs' performance ratings and trainees' self-ratings were compared to the performance ratings by IPs and trainees in a control group. The results indicate no difference in IP ratings or trainees' self-ratings for the control and experimental groups. The results indicated that the major beneficial role of a real-time oculometer system for pilots and copilots having a significant amount of flight experience would be for problem solving or refinement of instrument scanning behavior rather than a general instructional scheme. It is suggested that this line of research be continued with the incorporation of objective data (e.g., state of the aircraft data), measures of cost effectiveness and with trainees having less flight experience. Author

N83-20553*# Old Dominion Univ., Norfolk, Va.
THE EFFECTIVENESS OF AN OCULOMETER TRAINING TAPE ON PILOT AND COPILOT TRAINEES IN A COMMERCIAL FLIGHT TRAINING PROGRAM Final Report
Dennis H. Jones, Glynn D. Coates, and Raymond H. Kirby Washington NASA Mar. 1983 75 p refs
(Contract NAS1-15648)
(NASA-CR-3666; NAS 1.26:3666; Rept-81-25) Avail: NTIS HC A04/MF A01 CSCL 05I

A study was designed to evaluate the effectiveness of a video tape detailing the various aspects of instrument scanning by experienced pilots on performance by pilots and copilots undergoing flight training in a Boeing 737 flight simulator. The performance ratings by instructor pilots (IP's) and self-reported instrument scan behavior by trainees were compared with those of a control group. The results indicated that the training tape had little or no effect on performance by trainees in the experimental group. Feedback from the IP's and trainees suggested that a feedback strategy providing each trainee's individual instrument scan behavior might be more beneficial in flight training than the general instructional strategy of the oculometer training tape. Flight training personnel and trainees' reports of performance decrements on or around the third day of flight simulator training were investigated. The IP's performance ratings of 27 pilot and copilot trainees failed to reveal a systematic performance decrement; however, feedback from the trainees revealed that their own attribution of performance decrements was associated with the order in which their training occurred within a session. Further research was suggested.Author

N83-20554# Committee on Science and Technology (U. S. House). Subcomm. on Science, Research and Technology.
THE HUMAN FACTOR IN INNOVATION AND PRODUCTIVITY INCLUDING AN ANALYSIS OF HEARINGS ON THE HUMAN FACTOR
Wendy H. Schacht Washington GPO 1982 43 p Presented to the Comm. on Sci. and Technol., 97th Congr., 2d Sess., Oct. 1982 Prepared by the Library of Congr., Congr., Res. Serv.
(GPO-99-557) Avail: US Capitol, House Document Room

The human factor in innovation and productivity is considered. Author

N83-20555# Army Aeromedical Research Lab., Fort Rucker, Ala. Biomedical Applications Research Div.
PSYCHOLOGICAL EFFECTS OF CHEMICAL DEFENSE ENSEMBLE IMPOSED HEAT STRESS ON ARMY AVIATORS Final Report
Bruce E. Hamilton, Ronald R. Simmons, and Kent A. Kimball Nov. 1982 34 p refs
(DA Proj. 3E1-62777-A-879)
(AD-A121956; USAARL-83-6) Avail: NTIS HC A03/MF A01 CSCL 06/17

Psychological testing was conducted with six Army aviators before and after flights in a UH-1H helicopter while wearing standard flight suits, US or UK aircrew chemical defense ensembles. Additional testing on non-flight days was conducted to provide a baseline for evaluation. Tests consisted of encode/decode problems, math problems, logical reasoning problems, target detection problems, and a four-choice reaction time test. Tests were scored for number of attempted, percent correct, reaction time of correct and incorrect responses. Self reports of mood were also taken and scored. The results of the study indicated that various levels of ensemble-imposed heat stress caused orderly changes in psychological function and extended the results of laboratory investigations to the aviation setting. In addition, reaction time data showed changes in the pilot's ability to deal with error situations as a function of imposed heat stress and that self reports of mood were unreliable indicators of severe heat stress. Author (GRA)

N83-20556# Naval Training Analysis and Evaluation Group, Orlando, Fla.
EVALUATION OF THE COMPUTER AIDED TRAINING EVALUATION AND SCHEDULING (CATES) DECISION MODEL FOR ASSESSING FLIGHT TASK PROFICIENCY
William C. McDaniel, Betty M. Pereyra, William C. Rankin, and Paul G. Scott Sep. 1982 58 p refs
(AD-A121800; TAEG-TR-130) Avail: NTIS HC A04/MF A01 CSCL 05/9

Determining student performance level and subsequent decisions to either continue or stop training has posed a perplexing problem for instructors and training managers who provide pilot training. In flight pilot training involves both highly skilled human resources as well as sophisticated equipment. Therefore, training continued beyond established training objectives is costly. However, terminating training before the student pilot achieves the required skills is highly undesirable. A previous study (TAEG Report No. 94) proposed a Computer Aided Training Evaluation and scheduling (CATES) system to improve proficiency judgments during in flight training. This present study compared the efficacy of the CATES system with the present system of human judgment for assessing performance in flight training with regard to efficiency in reaching decisions and quality of decisions. The study also demonstrated that the CATES system can be used with some advantage in actual flight training program. Author (GRA)

N83-20557# Cornell Univ., Ithaca, N. Y. Dept. of Education.
THE INFORMATION CONTENT OF PICTURE-TEXT ASSEMBLY INSTRUCTIONS Technical Progress Report, 1 Sep. 1981 - 31 Mar. 1982
George R. Bieger and Marvin D. Glock Mar. 1982 38 p refs Sponsored in part by the Hatch Fund
(Contract N00014-80-C-0372; RR0420602; NR Proj. 157-452)
(AD-A120860; TR-6-Ser-B; TR-5) Avail: NTIS HC A03/MF A01 CSCL 05/9

A taxomy of the categories of information depicted in picture-text instructions for two procedural assembly tasks was developed and used experimentally. Three categories of information were hypothesized to be the necessary and sufficient information for successful execution of the procedures. Various combinations of information were presented to 108 subjects, each in one of 36 instructional conditions. Comparisons of performance data for two tasks indicated that subjects using complete instructions finished the assemblies in significantly less time and with significantly fewer errors than did those using incomplete instructions, thus confirming the experimental hypothesis. Author (GRA)

N83-20558# Oklahoma Univ., Norman. Decision Processes Lab.
A PARTITION OF SMALL GROUP PRECISION PERFORMANCE

INTO INFORMATIONAL AND SOCIAL COMPONENTS Technical Progress Report, Sep. 1981 - Aug. 1982
Jeff T. Casey, Charles F. Gettys, Rebecca M. Pliske, and Tom Mehle 30 Aug. 1982 34 p refs
(Contract N00014-80-C-0639; NR Proj. 197-066)
(AD-A120714; TR-30-8-82) Avail: NTIS HC A03/MF A01 CSCL 05/10

New theoretical and methodological techniques for partitioning and identifying the sources of performance differences between groups and individuals in hypothesis and act generation tasks are presented in two experiments. Experiment 1 presents a two-component model which separates group performance into informational and social components. The model proposes that the pooling of information in an interacting group (the information component) is mediated by the social factors (e.g., level of arousal, cohesiveness, etc.) which are present in a given situation. Interacting groups were found to be inferior to nominal groups in a hypothesis generation task. Thus, in Experiment 1, the social component was found to have a negative effect on performance. Experiment 2 further partitions the social component into a social information component which accounts for the additional information which becomes available as a result of group interaction and a social, non-informational component which consists of purely social factors. The social information component estimates the synergistic effect of group interaction on information retrieval and problem solving. The social informational component was estimated by including a group of subjects who exchanged ideas (information) via computers but had no social interaction. GRA

N83-20559# Oklahoma Univ., Norman. Decision Processes Lab.
ACT GENERATION PERFORMANCE: THE EFFECTS OF INCENTIVE Technical Progress Report, Sep. 1981 - Aug. 1982
Rebecca M. Pliske, Charles F. Gettys, Carol A. Manning, and Jeff T. Casey 15 Aug. 1982 36 p refs
(Contract N00014-80-C-0639; NR Proj. 197-066)
(AD-A120715; TR-15-8-82) Avail: NTIS HC A03/MF A01 CSCL 05/10

Two experiments explored the generalizability of earlier research which indicated that human act generation performance was impoverished. Subjects were given a realistic decision problem and were asked to generate actions which could be taken to solve the problem. Subjects in two incentive conditions were offered monetary rewards for generating additional actions. Subjects in one condition were rewarded for the sheer quantity of actions produced and subjects in the other condition were rewarded for the quality of the actions produced. In a second experiment, both expert and naive subjects judged the quality of the actions produced by subjects in the first experiment. The results replicate earlier research in that most subjects generated relatively few actions and they also failed to generate important actions as rated by both expert and naive judges. There were no significant differences between the performance of subjects in the incentive conditions and subjects in the control condition. Thus, even when subjects are given substantial monetary incentives to generate additional actions, their act generation performance is impoverished. Differences in the act generation performance of the quantity and quality incentive conditions are discussed. Author (GRA)

N83-20560# Oklahoma Univ., Norman. Decision Processes Lab.
THE ROLE OF A DECISION MAKERS PERSPECTIVE IN THE GENERATION AND ASSESSMENT OF ACTIONS IN A CONFLICT SITUATION Technical Progress Report, Jan. - Sep. 1982
Carol A. Manning 15 Sep. 1982 46 p refs
(Contract N00014-80-C-0639; NR Proj. 197-066)
(AD-A120738; TR-15-9-82) Avail: NTIS HC A03/MF A01 CSCL 05/10

Two experiments were performed to assess the influence of perspective and information on the generation of actions an opponent might take to resolve a conflict. Both experiments employed a problem in which guerrilla forces captured the French Embassy in a hypothetical South American country and took the personnel hostage. In the first experiment, subjects were assigned the perspective of a guerrilla, a hostage, or an advisor to the President of France. Experiment 2 was performed to assess the effect of providing both a perspective and information about an opponent's objectives on the generation of actions the opponent might take to resolve a conflict. These results may suggest that perspective has only a limited influence on the generation and assessment of actions an opponent might take to resolve a conflict. Without further research, it is difficult to determine whether perspective impairs a decision maker's performance in a conflict situation or whether its influence is only salient in hindsight. GRA

N83-20561# Decision Research Corp., Eugene, Oreg.
CATEGORICAL CONFIDENCE
Baruch Fischhoff, Don MacGregor, and Sarah Lichtenstein Jul. 1982 34 p refs
(Contract N00014-80-C-0150)
(AD-A120555; PTR-1092-82-7) Avail: NTIS HC A03/MF A01 CSCL 05/10

The present study attempted to improve the appropriateness of confidence with a seemingly nondirective tack. Subjects were asked to sort items into a specified number of piles according to their confidence in the correctness of their answers. Subsequently, they assigned a number of each pile expressing the probability that each item in the pile was correct. Even though this procedure differed from its predecessors in many respects, performance here was indistinguishable from that observed elsewhere. Though small pockets of improvement were noted, confidence was largely resistant to this manipulation. Some implications of these results for attempts to study confidence and eliminate overconfidence are discussed. GRA

N83-20562# Michigan Univ., Ann Arbor. Perception Lab.
VISUAL FORM DETECTION IN 3-DIMENSIONAL SPACE
William R. Uttal Oct. 1982 249 p refs
(Contract N00014-81-C-0266; RR04209002)
(AD-A120448; PERLAB-002) Avail: NTIS HC A11/MF A01 CSCL 05/1

This monograph presents the results of a program of research dealing with the detection of dotted stimulus forms embedded in dotted visual noise. Nineteen experiments are described concerning the detection of single flashing dots, dotted lines, and both random and regularly dotted planes. A mathematical model based upon the autocorrelational transform is also tested for some of the experiments. Among the most important findings are a remarkable insensitivity of the perceptual system to temporal and spatial irregularities and a qualitative difference in the way observers deal with planes formed from random dot arrays and dotted outlines respectively. The autocorrelation model is in general agreement with the psychophysical results against which it is tested. The main conclusion arising from this research may be summarized as the rule of linear periodicity. Observers are sensitive to forms to the extent that they contain dotted, straight lines with equal interdot spacing. This sensitivity appears to be a primitive of visual perception in a manner that is analogous to the sensitivity exhibited by the autocorrelation to periodic forms. Historical and lexicographic matters pertaining to the problem of form perception are also discussed in this monograph. Author (GRA)

N83-20563# Maryland Univ., College Park. Coll. of Business and Management.
THE EFFECT OF SELF-EFFICACY, GOALS AND TASK STRATEGIES ON TASK PERFORMANCE
Edwin A. Locke, Elizabeth Zubritzky, Cynthia Lee, and Philip Bobko Nov. 1982 43 p refs
(Contract N00014-79-C-0680)
(AD-A121490; GS-18-ONR) Avail: NTIS HC A03/MF A01 CSCL 05/9

This study examined the effect of self-efficacy, goals, and task strategies on goal choice and task performance. Self-efficacy and task strategies were manipulated through training. Ability, past performance and self-efficacy were the major predictors of goal choice. Ability, self-efficacy, goals and task strategies were all

related to task performance. Self-efficacy was more strongly related to past performance than to future performance but was still a significant predictor of future performance when past performance was controlled. Self-efficacy ratings for moderate to difficult levels of performance were the best predictors of future performance. This finding was replicated when two previous goal setting studies, which had found no positive expectancy-performance relationship across goal groups, were re-analyzed. It is suggested that the concept of self-efficacy might provide an integrating mechanism between the goal setting and social learning theory approaches to task performance. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N83-20564*# Houston Univ., Clear Lake, Tex.
ANALYSIS OF PHYSICAL EXERCISES AND EXERCISE PROTOCOLS FOR SPACE TRANSPORTATION SYSTEM OPERATION Final Report, 1 Sep. 1980 - 31 Dec. 1982
A. Eugene Coleman 31 Dec. 1982 51 p refs
(Contract NAS9-16136)
(NASA-CR-167807; NAS 1.26:167807) Avail: NTIS HC A04/MF A01 CSCL 06P

A quantitative evaluation of the Thornton-Whitmore treadmill was made so that informed management decisions regarding the role of this treadmill in operational flight crew exercise programs could be made. Specific tasks to be completed were: The Thornton-Whitmore passive treadmill as an exercise device at one-g was evaluated. Hardware, harness and restraint systems for use with the Thornton-Whitmore treadmill in the laboratory and in Shuttle flights were established. The quantitative and qualitative performance of human subjects on the Thorton-Whitmore treadmill with forces in excess of one-g, was evaluated. The performance of human subjects on the Thornton-Whitmore treadmill in weightlessness (onboard Shuttle flights) was also determined. S.L.

N83-20565# Virginia Polytechnic Inst. and State Univ., Blacksburg.
EFFECTS OF SYSTEM-TIMING PARAMETERS ON OPERATOR PERFORMANCE IN A PERSONNEL RECORDS TASK Final Report, 15 Jul. 1979 - 31 Mar. 1981
Robert C. Williges and Beverly H. Williges Nov. 1982 65 p refs
(Contract N00123-80-C-0300)
(AD-A121893; NPRDC-TN-83-1; VPI-17-82-5) Avail: NTIS HC A04/MF A01 CSCL 05/8

Meaningful human factors applications to the design of human/computer tasks require a quantitative data base that describes operator behavior as a function of various independent variables. Three classes of metrics, operator satisfaction ratings, work sampling procedures, and embedded performance measurement, are described as important measures in evaluating human/computer interfaces. Polynomial regression procedures were used to generate functional relationships between each of these classes of metrics and four independent variables representing timing attributes of an interactive computer system used to enter and update personnel records (system delay, display rate, keyboard echo rate, and rollover buffer length of the keyboard). Each of the 22 dependent variables in the three classes of metrics showed different functional relationships among the four system variables, but overall system delay and keyboard echo rate were the major predictors of operator behavior. Additionally, the three classes of metrics were combined into three underlying interface dimensions relating to operator production, waiting, and planning activities.
Author

N83-20566# Electronic Data Systems Corp., Panama City, Fla.
IMPROVED SELF-CONTAINED BREATHING APPARATUS CONCEPT Final Report, Oct. 1980 - Jun. 1982
Lloyd White and Joseph Walker Tyndall AFB, Fla. AFESC Aug. 1982 201 p
(Contract F08635-80-C-0297; AF Proj. 2505)
(AD-A120944; AFESC/ESL-TR-82-24) Avail: NTIS HC A10/MF A01 CSCL 06/11

Past operational experiences of USAF fire fighting and rescue teams have indicated the need for an improved self-contained breathing apparatus (SCBA). In October 1980, a contract was awarded to Electronic Data Systems, Panama City, Florida, to design and develop a prototype SCBA that would meet Air Force technical requirements. A prototype was designed, developed, and tested through a subcontract with Reimers Consultants, Falls Church, Virginia. This report describes the technical requirements, a detailed technical description of the unit, and the unmanned test procedures and results. The unmanned testing demonstrate that the prototype SCBA meets all performance requirements, except for weight. The fully charged prototype weights 34 pounds, the maximum acceptable weight is 30 pounds. With the other performance requirements either met or exceeded, manned testing of the SCBA can proceed. Author (GRA)

N83-20567# Cornell Univ., Ithaca, N. Y. Dept. of Computer Science.
DETERMINING POINTS OF A CIRCULAR REGION REACHABLE BY JOINTS OF A ROBOT ARM
John E. Hopcroft, Deborah A. Joseph, and Sue H. Whitesides Oct. 1982 44 p ref
(Contract N00014-76-C-0018; Grant NSF MCS-81-01220)
(AD-A121992; CU-CSD-TR-82-516) Avail: NTIS HC A03/MF A01 CSCL 12/1

An arm is a sequence of links whose endpoints are connected consecutively by movable joints. The location of the first endpoint is fixed. This report gives a polynomial time algorithm for determining the regions that each joint can reach when the arm is restricted to a circular region of the plane. Author (GRA)

N83-20568# Navy Personnel Research and Development Center, San Diego, Calif.
ACCURACY, TIMELINESS, AND USABILITY OF EXPERIMENTAL SOURCE DATA MODULES Final Report, 1980 - 1981
John S. Malone, Richard W. Obermayer, Eleanor R. N. Robinson, and Kenneth H. Funk (Oregon State Univ.) Nov. 1982 45 p refs
(AD-A121788; NPRDC-TR-83-1) Avail: NTIS HC A03/MF A01 CSCL 05/8

Three computer interface systems were developed and tested in a Navy Pay/Personnel Administrative Support System (PASS) office. These three systems were used to analyze personnel performance times, errors, and the effects of computer system parameters on error rates. This report describes the interface systems, discusses their advantages and limitations, and provides recommendations for the future development of a source data entry module for use in personnel office information systems.
Author (GRA)

N83-20569# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
MMI CONSIDERATIONS IN THE TELETIDE GRAPHICS SYSTEM
Carol McCann Jun. 1982 21 p refs
(AD-A121753; DCIEM-TC-82-C-20) Avail: NTIS HC A02/MF A01 CSCL 05/8

SHAPE Technical Center has developed the Transitional Information Distribution Experiment (TIDE) to study the storage, handling and display of information in SHAPE HQ. This report comments on some human factors aspects of the Teletide Graphics System (Version 2.0), the part of TIDE used to create, manipulate and display information on maps. Relevant portions of DCIEM research plans are briefly described. GRA

N83-20570# Army Aeromedical Research Lab., Fort Rucker, Ala. Biomedical Applications Research Div.
PERFORMANCE IMPACT OF CURRENT UNITED STATES AND UNITED KINGDOM AIRCREW CHEMICAL DEFENSE ENSEMBLES

Final Report, 1 Jul. 1981 - Jul. 1982
Bruce E. Hamilton, Dennis Folds, and Ronald R. Simmons Sep. 1982 44 p refs
(AD-A121502; USAARL-82-9) Avail: NTIS HC A03/MF A01 CSCL 15/2

The ability of helicopter pilots to fly while wearing chemical defense (CD) ensembles in hot weather was investigated. Each subject flew on three separate days, wearing a different ensemble each day. The ensembles tested were the United States Army Aircrew chemical defense ensemble, the United Kingdom aircrew chemical defense ensemble, and the United States Army standard flight suit uniform. While subjects made statistically larger heading errors while wearing the US chemical defense ensemble, no operationally significant differences in performance were seen. It is concluded that a pilot's performance is not an indicator of heat stress. E.A.K.

N83-20571# Cornell Univ., Ithaca, N. Y. Dept. of Computer Science.
MOVEMENT PROBLEMS FOR 2-DIMENSIONAL LINKAGES
John E. Hopcroft, Deborah A. Joseph, and Sue H. Whitesides Aug. 1982 30 p refs
(Contract N00014-76-C-0018)
(AD-A121954; TR-82-515) Avail: NTIS HC A03/MF A01 CSCL 06/4

This paper is motivated by questions concerning the planning of motion in robotics. In particular, it is concerned with the motion of planar linkages from the complexity point of view. There are two main results. First, a planar linkage can be constrained to stay inside a bounded region whose boundary consists of straight lines by the addition of a polynomial number of new links. Second, the question of whether a planar linkage in some initial configurations can be moved so that a designated joint reaches a given point in the plane is PSPACE-hard. Author (GRA)

N83-20572# National Academy of Sciences - National Research Council, Washington, D. C. Advisory Board on Military Personnel Supplies.
DEHYDRATION AND COMPRESSION OF FOODS Final Workshop Report
1982 49 p refs
(Contract DAAK60-79-C-0015)
(PB83-111682; ABMPS-116) Avail: NTIS HC A03/MF A01 CSCL 06H

This report contains an examination of the problems faced by the armed forces in attempting to obtain high quality, dehydrated compressed foods as economically as possible. GRA

N83-20573# National Academy of Sciences - National Research Council, Arlington, Va. Committee on Animal Products.
RECONSTRUCTED MEAT TECHNOLOGY FOR THE MILITARY
1982 52 p refs
(Contract DAAK60-79-C-0015)
(PB83-11690; ABMPS-124) Avail: NTIS HC A04/MF A01 CSCL 06H

Areas of the technology of restructured meats of particular interest to the military such as equipment, processes, and products are discussed. Additives that influence the functional properties of restructured meats; storage stability; mechanically deboned and desinewed meats in restructured meats; and restructured marine products are also discussed. GRA

N83-20694# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
DISPLAY-CONTROL COMPATIBILITY IN 3-D DISPLAYS
A. W. F. Huggins and D. J. Getty *In* NAS-NRC Three-Dimensional Displays 1982 p 29-54 refs (For primary document see N83-20692 10-70)
Avail: NTIS HC A09/MF A01 CSCL 05/8

N83-19783*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Control Center.
THE MEASUREMENT OF OPERATOR WORKLOAD IN THE MARK IVA DSCC MONITOR AND CONTROL SUBSYSTEM
M. LeMay (Monclair State Coll.), R. L. Chafin, and E. E. Hird *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 177-185 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 05H

N83-20274# Societe d'Etudes et Conseils Aero, Paris (France).
HUMAN FACTORS ASPECT AS AN EXTENSION OF QUALITY ASPECTS [LE PLAN FACTEURS HUMAINS COMME EXTENSION DE PLAN DE QUALITE]
J. Marguin *In* ESA Reliability and Maintainability Sep. 1982 p 685-692 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N83-20574 Royal Signals and Radar Establishment, Malvern (England).
THE AXIS TEST BOX OPERATING GUIDE
A. L. Simcock Oct. 1982 36 p refs
(BR86136; RSRE-MEMO-3517) Copyright. Avail: Issuing Activity

This Memorandum is the Operating Guide for the microprocessor controlled test box built for Project AXIS. The operating guide is designed to be both a comprehensive step by step guide and also a 'quick reference' guide for the experienced user. Author

N83-20575 Royal Signals and Radar Establishment, Malvern (England).
THE DISCUS HARDWARE SYSTEM
H. S. Field-Richards Jul. 1982 94 p refs
(BR86160; RSRE-82010) Copyright. Avail: Issuing Acitivity

The hardware philosophy behind the Distributed Control Microprocessor System (DISCUS) developed at the Royal Signals and Radar Establishment is described. DISCUS is an array of up to 15 asynchronous microprocessors that are star connected around a global store. The system is compared to other architectures, and the general philosophy behind the design of DISCUS. This is to keep the hardware and software as simple as possible while achieving the aims of system recovery and diagnostics. Enhancements for the future such as the choice of microprocessor and bus are discussed as well as the present and possible future recovery aids. Author

N83-20576# British Aerospace Dynamics Group, Stevenage (England). Reliability and Maintainability Dept.
RELIABILITY ASPECTS OF MICROPROCESSOR SYSTEMS

C. J. Dale, L. N. Harris, P. D. T. OConnor, and G. Rzevski Jul. 1981 212 p
(BR79567; ST-25358) Avail: NTIS HC A10/MF A01

This report is the result of a study carried out to identify and evaluate past and present research on reliability aspects of microprocessor systems and to identify key areas affecting microprocessor system reliability. The emphasis is placed on a system viewpoint, with rather more attention given to software than to hardware. After defining various basic concepts and stating the problem, the report summarises reliability improvement methods and reliability evaluation methods. An extensive annotated bibliography is included as an appendix. Author

N83-20577# California Univ., Berkeley.
VLSI IMPLEMENTATION OF DIGITAL FOURIER TRANSFORMS Final Technical Report, 1 Aug. 1978 - 31 Aug. 1982
A. Despain, C. Sequin, C. Thompson, E. Wold, and D. Lioupis 1 Nov. 1982 97 p refs
(Grant DAAG29-78-G-0167)
(AD-A121898; ARO-15801.4-EL) Avail: NTIS HC A05/MF A01 CSCL 09/2

The construction of Fast Fourier Transform (FFT) processors is discussed. Pipeline and parallel-pipeline organizations are developed and are shown to meet the constraints imposed by VLSI. Various circuit technologies for the construction of these processors are compared, and the description of a set of NMOS chips are given. A technique for reducing the latency of the adders internal to the chips is also presented. Finally, a broad set of possible FFT organizations is discussed. Author (GRA)

N83-20578# Purdue Univ., Lafayette, Ind. Dept. of Computer Science.
WAFER SCALE INTEGRATION OF PARALLEL PROCESSORS Interim Report
Kye Sherrick Hedlund Nov. 1982 265 p refs
(Contracts N00014-80-K-0816; N00014-81-K-0360)
(AD-A121886; CSD-TR-411) Avail: NTIS HC A12/MF A01 CSCL 09/2

This research examines the problem of construction chips up to the size of the wafer (wafer scale integration) that operate correctly despite the occurrence of such flaws. We concentrate on a particular family of parallel processors, configurable, highly parallel (CHiP) processors. The key problem in the implementation of wafer scale integration is structuring the wafer so that only the functional PEs are connected together. A methodology, the two-level hierarchy, that efficiently and economically solves the structuring problem for CHiP processors is presented. The principle elements are the use of column exclusion with high yield building blocks that contain redundant components. This approach limits the performance degradation due to structuring and allows the structuring problem to be solved with tractable computational effort. Since the yield of building blocks must be high for the two-level hierarchy to be a practical approach, yield phenomena are investigated in detail. GRA

N83-20579# Purdue Univ., Lafayette, Ind. Dept. of Computer Science.
A MODEL FOR ANALYZING GENERALIZED INTERPROCESSOR COMMUNICATION SYSTEMS Interim Report
Janice E. Cuny and Lawrence Snyder 6 Oct. 1982 14 p refs
(Contracts N00014-80-K-0816; N00014-81-K-0360)
(AD-A121885; CSD-TR-406) Avail: NTIS HC A02/MF A01 CSCL 09/2

We present a model of parallel computation which is parameterized by execution mode, allowing us to express different modes within a common framework. The model enables us to make legitimate comparisons of execution modes. We report here on some preliminary results. Author (GRA)

N83-20580# Naval Postgraduate School, Monterey, Calif. Dept. of Computer Science.
IMPLEMENTATION OF THE VGM GRAPHIC SYSTEM ON THE PDP-11/50 UNDER THE RSX-11M OPERATING SYSTEM AND CONSTRUCTION OF A COMPATIBLE SOFTWARE DRIVER FOR THE RAMTEK RM-9400 M.S. Thesis
Partrick Michael Comi Jun. 1982 88 p refs
(AD-A121918) Avail: NTIS HC A05/MF A01 CSCL 09/2

In 1977 the ACM Special Interest Group for Graphics (SIGGRAPH) formed the Graphics Standards Planning Committee (GSPC) to develop a standard for the industry. The result of their efforts was the CORE graphics system. This study discusses that system and the issues involved in its creation. It describes Bell Northern Research's approach to implementing CORE with their Virtual Graphics Machine (VGM). The installation of VGM at the Naval Postgraduate School on a PDP 11/50 with the RSX-11M operating system is described as well as the initial efforts to expand it to drive the Ramtex RM-9400 Graphics Display System. Author (GRA)

N83-20581# Stanford Univ., Calif. Integrated Circuits Lab.
COMPUTER-AIDED DESIGN OF INTEGRATED CIRCUIT FABRICATION PROCESSES FOR VLSI DEVICES Final Report, 15 Feb. 1981 - 31 Mar. 1982
James D. Plummer, Robert W. Dutton, James F. Gibbons, C. R. Helms, and James D. Meindl Jul. 1982 452 p refs
(Contract MDA903-79-C-0247; ARPA Order 3709)
(AD-A121414; DELET-TR-79-0257-3; ICL-17-79; TR-DXG501-82) Avail: NTIS HC A20/MF A01 CSCL 09/2

Efficient design of high performance VLSI processes requires accurate models for the physical processes used for fabrication. This is particularly true as device geometries shrink and fabrication technologies become inherently 2D. First order models for thermal oxidation, ion implantation, diffusion, chemical vapor deposition and other processes cannot accurately predict device structures which result from modern IC technologies. The fundamental objective of this program is to develop accurate and physically correct models for these processes which are general enough to incorporate in a general purpose, user-oriented computer simulation tool - SUPREM. This program accepts process schedules as inputs and provides predicted device structures as outputs. It is meant to be capable of accurately simulating both bipolar and MOS VLSI structures. SUPREM is specifically designed to couple with device simulation tools so that it forms the cornerstone of a hierarchy of VLSI process, device, circuit and system design aids. Author (GRA)

N83-20582# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
A UNIX BENCHMARKING TOOL WITH RESULTS FROM THE PDP-11/44, VAX-11/780, AND PERKIN-ELMER 3242
Martin Tuori Jun. 1982 12 p Prepared in cooperation with Toronto Univ., Ontario
(AD-A121754; DCIEM-RP-82-P-23) Avail: NTIS HC A02/MF A01 CSCL 09/2

A facility is described that offers a high level means of exercising and performance testing a UNIX timesharing system. Its structure is explained, and resulting issues and limitations are discussed. Results were obtained on several different computer systems, including a PDP-11/44, a VAX-11/780, and a Perkin-Elmer 3242, each running a variation or extension of Version 7 UNIX. M.G.

N83-20583# Harry Diamond Labs., Adelphi, Md.
NEW NONVOLATILE MEMORY WITH RAM CAPABILITIES AND INTRINSIC RADIATION HARDNESS
Philip S. Brody and Emanuel Katzen Oct. 1982 28 p refs
(DA Proj. 1L1-61101-A-91A)
(AD-A122324; HDL-TM-82-14) Avail: NTIS HC A03/MF A01 CSCL 09/1

This report describes theoretical and experimental work performed in connection with the development of a new kind of electronic computer memory. The memory is based on a hybrid combination of semiconductor and ferroelectric ceramic elements which uses an anomalous photovoltaic effect found in the ferroelectric ceramics. This memory is a variation on the conventional static or dynamic semiconductor memories in common use.

Conventional devices are volatile memories which lose their information content when power to the devices is interrupted. Devices based on the concept, however, are nonvolatile. In some respects they have memory characteristics similar to those of metal nitride oxide semiconductor (MNOS) and floating gate EAPROM (electrically alterable programmable read-only memory) devices. The new photovoltaic ferroelectric-semiconductor, however, can be expected to be superior to the presently available EAPROM devices. This new device will excel in programming time, in the number of possible read/write cycles, and in retention of the encoded memory states. Based on the work, described in this report, the device is also expected to be superior in surviving environmental radiation. GRA

N83-20584# Los Alamos Scientific Lab., N. Mex.
MULTIPLICITY SORTER FOR SHIFT-REGISTER COINCIDENCE ELECTRONICS
J. E. Swansen, P. R. Collinsworth, M. S. Krick, and D. L. Peterson Feb. 1982 9 p refs
(Contract W-7405-eng-36)
(DE82-008988; LA-9221-MS) Avail: NTIS HC A02/MF A01

A multiplicity sorter for the latest Los Alamos National Laboratory version of shift-register coincidence electronics is described. The multiplicity information taken from the coincidence gate up-down counter is decoded and gated onto the output lines by prompt real-plus-accidental (R + A) and delayed accidential (A) strobes. Multiplicities of 0-7 and than or equal to greater 8 are sorted for both the R + A and A gates. DOE

N83-20585# SoHaR, Inc., Los Angeles, Calif.
COMPUTER SCIENCE AND TECNOLOGY: THE INTRODUCTION OF SOFTWARE TOOLS Final Report
Herbert Hecht Sep. 1982 44 p refs
(PB83-107003; LC-82-600577) Avail: NTIS HC A03/MF A01 CSCL 09B

From a survey of current tool usage it is concluded that the greatest obstacles to effective use of software tools are encountered in organizations employing fewer than 40 programmers, and the needs of these environments are therefore emphasized. Specific needs for software tools in programming for management information systems and for scientific applications are discussed. Measures are described to overcome organizational obstacles to use of tools, to deal with problems arising from the tools, and to reduce the difficulties posed by existing computer installations. Steps required for the successful introduction of tools are organized in two ways: by the function responsible for their accomplishment, and by the time schedule in which they must be completed. The detail work to be performed in each step is described. GRA

N83-20586# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
MICRO FOCUS LTD: LEVEL II COBOL V1.0
31 Dec. 1981 14 p
(PB83-104083; FCTC-81-44) Avail: NTIS HC A02/MF A01 CSCL 09B

This FCTC Technical Report for the MICRO FOCUS LTD. Level II COBOL V1.0 running under the CP/M/86 provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the CP/M/86 of the 1974 COBOL Standard (X3.23-1974/FIPS 21-1). This technical report is made up of several sections showing all the discrepancies found - if any. A companion report Validation Summary Report FCTC-81/131 provides information regarding the validation of the compiler as the High-Intermediate level of Federal Standard COBOL (FIPS PUB 21-1). GRA

N83-20587# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
MICRO FOCUS LTD CIS COBOL VERSION 4.5
31 Dec. 1981 16 p
(PB83-104075; FCTC-81-43) Avail: NTIS HC A02/MF A01 CSCL 09B

This FCTC Technical Report for the MICRO FOCUS LTD. CIS COBOL Version 4.5 running under the CP/M Version 2.2 provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Indexed I-O Level 1 Inter-Program Communication Level 2 of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This technical report is made up of several sections showing all the discrepancies found - if any. A companion report Validation Summary Report FCTC-81/130 provides information regarding the validation of the compiler as the Low-Intermediate level of Federal Standard COBOL (FIPS PUB 21-1). GRA

N83-20588# Federal Compiler Testing Center, Falls Church, Va.
CONVERGENT TECHNOLOGIES IWS 110, CT COBOL 4.0
1 Feb. 1982 13 p refs
(PB83-104471; FCTC-81-048) Avail: NTIS HC A02/MF A01 CSCL 09B

This FCTC Technical Report for the Convergent Technologies CT COBOL 4.0 running under the CTOS CWSLFS - X6.12 provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Indexed I-O, Level 1 of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This technical report is made up of several sections showing all the discrepancies found - if any. A companion repot Validation Summary Report FCTC-81/141 provides information regarding the validation of the compiler as the Low-Intermediate level of Federal Standard COBOL (FIPS PUB 21-1). GRA

N83-19772*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Section.
A VLSI IMPLEMENTATION OF A MULTICODE CONVOLUTIONAL ENCODER
L. J. Deutsch *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 61-69 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 09B

N83-20193# Institut National de Recherche d'Informatique et d'Automatique, Toulouse (France).
THE SARGOS COMPUTER SYSTEM REDUNDANT MULTIPROCESSOR ARCHITECTURE (ARMURE) [ARMURE: ARCHITECTURE MULTI-PROCESSEUR REDONDANTE DU SYSTEME INFORMATIQUE DE SARGOS]
Y. Deswarte, P. Cohen, A. Machonin, K. Qadiri, N. Gargir, , and J. Lerouge *In* ESA Reliability and Maintainability Sep. 1982 p 103-111 refs In FRENCH (For primary document see N83-20178 10-38)
(Contract ADI/SURF-80.073)
Avail: NTIS HC A99/MF A01

N83-20194# Compagnie de Signaux et d'Etreprises Electrique, Paris (France).
THE PAC: A SELF-CHECKING CONTROL PROCESSOR
J. N. Benso, R. Fourre, P. Larger, and P. Legris *In* ESA Reliability and Maintainability Sep. 1982 p 113-116 (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20198# Health and Safety Executive, Sheffield (England). Research and Laboratory Services Div.
HARDWARE/SOFTWARE RELIABILITY CONSIDERATIONS IN THE DESIGN OF MICROPROCESSOR CONTROLLED INDUSTRIAL SAFETY SYSTEMS
J. H. Powell *In* ESA Reliability and Maintainability Sep. 1982 p 143-149 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20209# Conservatoire National des Arts et Metiers, Paris (France).
OPTIMIZATION IN THE DESIGN OF COMPUTER SYSTEMS ARCHITECTURE [OPTIMISATION DANS LA CONCEPTION D'ARCHITECTURES INFORMATIQUES]
V. Delebarre *In* ESA Reliability and Maintainability Sep. 1982 p 229-234 refs In FRENCH (For primary document see N83-20178

10-38)
Avail: NTIS HC A99/MF A01

N83-20246# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Surete Nucleaire.
EFFECT OF NUCLEAR RADIATION ON THE RELIABILITY OF MICROPROCESSING AND ASSOCIATED CIRCUITS [EFFET DES RAYONNEMENTS NUCLEAIRES SUR LA FIABILITE DES MICROPROCESSEURS ET CIRCUITS ASSOCIES]
A. Laviron and J. Grisollet *In* ESA Reliability and Maintainability Sep. 1982 p 493-496 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20267# Institut de Mathematiques Appliquees de Grenoble (France).
MICROPROCESSOR BEHAVIOR TEST AND AUTOMATIC GENERATION OF TESTS PROGRAMS [TEST COMPORTEMENTAL DE MICROPROCESSEURS ET GENERATION AUTOMATIQUE DES PROGRAMMES DE TEST]
C. Bellon, A. Liothin, S. Sadier, G. Saucier, R. Velazco (Electron. Marcel Dassault), and M. Issenmann *In* ESA Reliability and Maintainability Sep. 1982 p 633-638 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N83-20589*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NETWORK SIMULATION USING THE SIMULATION LANGUAGE FOR ALTERNATE MODELING (SLAM 2)
Stewart Shen (Old Dominion Univ.) and Douglas W. Morris Feb. 1983 34 p refs
(NASA-TM-84605; NAS 1.15:84605) Avail: NTIS HC A03/MF A01 CSCL 09B

The simulation language for alternate modeling (SLAM 2) is a general purpose language that combines network, discrete event, and continuous modeling capabilities in a single language system. The efficacy of the system's network modeling is examined and discussed. Examples are given of the symbolism that is used, and an example problem and model are derived. The results are discussed in terms of the ease of programming, special features, and system limitations. The system offers many features which allow rapid model development and provides an informative standardized output. The system also has limitations which may cause undetected errors and misleading reports unless the user is aware of these programming characteristics. Author

N83-20590*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE TEKLIB GRAPHIC LIBRARY
Susan W. Bostic Mar. 1983 26 p refs
(NASA-TM-84633; NAS 1.15:84633) Avail: NTIS HC A03/MF A01 CSCL 09B

TEKLIB is a library of procedures written in TI PASCAL to perform basic graphic tasks. TEKLIB was written to provide an interface between a graphics terminal and the TI 990 . The TI 990 is used as a controller for the Finite Element Machine which is an array of microprocessors designed to solve problems by finite element methods in parallel. The use of TEKLIB provides a means of inputting data graphically and displaying output. Author

N83-20591*# Virginia Univ., Charlottesville. Dept. of Applied Mathematics and Computer Science.
ON THE ENGINEERING OF CRUCIAL SOFTWARE Final Report, 1 Nov. 1981 - 31 Oct. 1982
Terrence W. Pratt, John C. Knight, and Samuel T. Gregory Feb. 1983 231 p refs
(Grant NAG1-233)
(NASA-CR-170012; NAS 1.26:170012; UVA/528208/AMCS83/102) Avail: NTIS HC A11/MF A01 CSCL 09B

The various aspects of the conventional software development cycle are examined. This cycle was the basis of the augmented approach contained in the original grant proposal. This cycle was found inadequate for crucial software development, and the justification for this opinion is presented. Several possible enhancements to the conventional software cycle are discussed. Software fault tolerance, a possible enhancement of major importance, is discussed separately. Formal verification using mathematical proof is considered. Automatic programming is a radical alternative to the conventional cycle and is discussed. Recommendations for a comprehensive approach are presented, and various experiments which could be conducted in AIRLAB are described. Author

N83-20592# Naval Research Lab., Washington, D. C.
GRAFIT: A DICOMED EXTENSION Interim Report
E. Dent 15 Nov. 1982 18 p
(RR0330244)
(AD-A121623; AD-E000505; NRL-MR-4951) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report discusses the changes to GRAFIT mode by S. J. Marsh and Sarah Freeman. Their changes consist of improvements (speedwise) to the Tektronic portion of GRAFIT and the addition of the DICOMED interface. GRA

N83-20593# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Geotechnical Lab.
USER'S GUIDE FOR COMPUTER PROGRAM HEAVE Final Report
Lawrence D. Johnson Sep. 1982 42 p refs
(AD-A121883; WES/MP/GL-82-7) Avail: NTIS HC A03/MF A01 CSCL 13/13

The program HEAVE is a one-dimensional computer program for approximate analysis of vertical movements of swelling foundation soils beneath permanent structures caused by changes in vertical loads and/or the moisture profile. The program is applicable to slab, long continuous, and circular shaft foundations. Results of both one-dimensional consolidometer swell tests and soil suction tests may be used in HEAVE. The program considers effects of soil overburden pressures and structural loads, hetergeneous soils, and saturated or hydrostatic equilibrium moisture profiles on the computed heave. HEAVE can estimate the movement of circular drilled shaft foundations, the maximum tension force in circular shafts from heave of surrounding swelling soil, and the restraining force provided by the underream (a bell or enlargement of the shaft base). GRA

N83-20594# Desmatics, Inc., State College, Pa.
FACTOR SCREENING IN SIMULATION: EVALUATION OF TWO STRATEGIES BASED ON RANDOM BALANCE SAMPLING
Carl A. Mauro and Dennis E. Smith Nov. 1982 32 p refs
(Contract N00014-79-C-0650; NR Proj. 042-467)
(AD-A121874; TR-113-7) Avail: NTIS HC A03/MF A01 CSCL 12/1

In the study of large, complex computer simulation models the user is often overwhelmed by the vast number of input variables. Moreover, he or she is usually confused about how to make an effective analysis of the model without performing an excessive number of runs, which tend to be costly and time consuming. Factor screening methods, which attempt to identify the more important variables, can be extremely useful in the study of such models. This paper presents and evaluates two screening strategies based upon random balance sampling. Both strategies are applicable when there are more variables to be screened than there are available screening runs. The results provide guidance in using these strategies in particular screening applications.
Author (GRA)

N83-20595# Wisconsin Univ., Madison. Mathematics Research Center.
DIFFERENTIATION IN PASCAL-SC: TYPE GRADIENT Technical Summary Report
L. B. Rall Jul. 1982 38 p refs
(Contract DAAG29-80-C-0041)
(AD-A120959; MRC-TSR-2400) Avail: NTIS HC A03/MF A01 CSCL 12/1

In scientific computation, there is often need for the derivatives as well as the values of functions defined by computer programs. Here, it is shown how automatic differentation can be carried out in a modern computer language which permits user-defined operators and data types. The specific language used is PASCAL-SC, and differentation is implemented for variables of type GRADIENT vector of first partial derivatives with respect to the independent variables. Calculations of the results of operators or functions applied to GRADIENT variables are carried out according to the well-known rules for evaluation and differentiation of sums, differences, products, and so on. Since the differentiation is performed at compile time, the code produced is comparable in compactness and execution time to that obtained if numerical approximations are used for derivatives, and the theoretical and practical problems associated with numerical differentiation are avoided. PASCAL-SC source code is given for the necessary operators and standard functions, and it is shown how to prepare code for arbitrary differentiable functions to add to the library if desired. The effectiveness of the use of type GRADIENT is shown by an example of the solution of a system of nonlinear equations by Newton's method. Author (GRA)

N83-20596# Northwestern Univ., Evanston, Ill. Dept. of Electrical Engineering and Computer Science.
DEVELOPMENT OF DISTRIBUTED COMPUTING SYSTEMS SOFTWARE DESIGN METHODOLOGIES Final Report, 22 Sep. 1980 - 31 Jul. 1982
Stephen S. Yau 5 Nov. 1982 5 p
(Contract DAAG29-80-K-0092)
(AD-A121941; ARO-17509.7-EL) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report summarizes the important results obtained during the project period. One important result is the development of a design representation technique based on attributed grammars. The other is the development of a design approach based on Petri nets emphasizing modularity. Both results have been presented in detail in papers published or to be published in the scientific journals or conference proceedings. Author (GRA)

N83-20597# University of Central Florida, Orlando. Dept. of Electrical Engineering.
REAL SCAN EVOLUTION Final Report, Jan. - Dec. 1981
Benjamin W. Patz, Phil Gatt, Gerald L. Becker, Sam M. Richie, Richard LeBlanc, and Linda Coulter Feb. 1982 633 p refs
(Contract N61339-80-D-0014; WF57526490)
(AD-A122000; NAVTRAEQUIPC-80-D-D014-2) Avail: NTIS HC A99/MF A01 CSCL 09/2

This report describes the development and evaluation of a computer graphics algorithm capable of rendering high detail imagery of real world visual environments modeled as a single valued elevation function of horizontal location. The objective of the development was to analyze the feasibility of a real time implementation. The results indicate that, although technically feasible, the real time implementation is too computationally expensive to consider. Recommendations for future work to reduce expenses are made. Author (GRA)

N83-20598# University of Southeastern Massachusetts, North Dartmouth. Dept. of Electrical Engineering.
STATISTICAL IMAGE PROCESSING Final Report, 1 Jun. 1979 - 31 Aug. 1982
C. H. Chen 16 Nov. 1982 46 p refs
(Contract N00014-79-C-0494)
(AD-A121999) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report summarizes the major research work accomplished under the contract including the topics of statistical image models, comparative evaluation of image processing techniques, image segmentation algorithms, two-dimensional maximum entropy spectral analysis, and spatial clustering algorithms with applications to artificial and remotely sensed images. Detailed list of publications available in open literature is provided. A list of software package generated is included in the Appendices. Author (GRA)

N83-20599# Naval Postgraduate School, Monterey, Calif.
REPRESENTATION TECHNIQUES FOR RELATIONAL LANGUAGES AND THE WORST CASE ASYMPTOTICAL TIME COMPLEXITY BEHAVIOUR OF THE RELATED ALGORITHMS M.S. Thesis
Suha Futaci Jun. 1982 353 p refs
(AD-A121995) Avail: NTIS HC A16/MF A01 CSCL 12/1

This thesis is aimed at determining the worst case asymptotical time complexity behavior of algorithms for relational operations that work on extensionally or intensionally represented binary relations. Those relational operations came from a relational language being designed at Naval Postgraduate School. One particular extensional representation technique and two intensional representation techniques are proposed. The above analysis in turn determines the feasibility of implementing a subset of the relational language on conventional architectures. Author (GRA)

N83-20600# Control Data Corp., Minneapolis, Minn. Information Sciences Div.
TRANSPORTABLE MAPS SOFTWARE, VOLUME 1 Final Technical Report
A. E. LaBonte Griffiss AFB, N.Y. RADC Jul. 1982 325 p
(Contract F30602-80-C-0326; AF Proj. 4594)
(AD-A120982; RADC-TR-82-194-Vol-1; Rept-9199500-Vol-1) Avail: NTIS HC A14/MF A01 CSCL 20/6

This report covers the development of a transportable software package in FORTRAN for the MAPS image compression technique. Also included are a user's manual for the developed software, a software maintenance manual, and the software listing. Possession of the report will allow a user to install and operate this software on DEC PDP 11/45, 11/70 and VAX 11/780 processors. GRA

N83-20601# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
ARPANET ROUTING ALGORITHM IMPROVEMENTS, VOLUME 2 Technical Progress Report, 1 Sep. 1980 - 15 Apr. 1982
J. F. Haverty, B. L. Hitson, J. Mayersohn, P. J. Sevcik, and G. J. Williams Mar. 1982 286 p refs 2 Vol.
(Contract MDA903-78-C-0129; ARPA Order 3491)
(AD-A121350; BBN-4931) Avail: NTIS HC A13/MF A01 CSCL 09/2

This report covers the work performed during the second year of the extension to the ARPANET Routing Algorithm Improvements Contract. The ARPANET simulator developed during the first year of the extension is used to investigate the performance and behavior of a number of routing algorithms, including the current ARPANET SPF algorithm. Results from the simulator are compared to measurements of SPF running on a small test network, measurements of the line protocol on the operational ARPANET, and the predictions of a stability model developed during the original contract. The simulation was run on a 14-node network using fixed single-path, fixed multi-path, and SPF (adaptive) routing. The performance of each routing method as a function of network load is compared to the predictions of a queueing model. As part of the design of an Internet, this report discusses design issues in the implementation of gateways, including the host interface to the Internet, interoperability of autonomous gateway systems, congestion control, and logical addressing. GRA

N83-20602# Rensselaer Polytechnic Inst., Troy, N. Y. Image Processing Lab.
DOCUMENTATION MANUAL GRAPHICS PACKAGE NUMBER 1 (GP/1) AND PROGRAM OCTREE
Donald Meagher Aug. 1982 157 p
(Contract N00014-82-K-0301; Grant NSF ENG-79-04821; NR Proj.

049-515)
(AD-A121405; IPL-TR-028) Avail: NTIS HC A08/MF A01 CSCL 09/2

Graphics Package No. 1 (GP/1) is a general-purpose support package for graphics applications. It is written in FORTRAN and operates on a Prime computer system with an Imlac 6220 graphics terminal. The user interface is presented along with a sample work session. It is intended for users of systems based on GP/1. Programmer information is also provided for new applications. Program OCTREE is a solid modeling package based on GP/1. It also requires a DeAnza 1P5532 color raster graphics display for shaded output (the system was developed for use at the Image Processing Laboratory at Rensselaer Polytechnic Institute. User and programming information is presented.
Author (GRA)

N83-20603# Department of Defense, Washington, D. C. Office of Under Secretary of Defense, Research and Advanced Technology.
STRATEGY FOR A DOD SOFTWARE INITIATIVE
Larry Druffel 1 Oct. 1982 45 p 2 Vol.
(AD-A121737) Avail: NTIS HC A03/MF A01 CSCL 09/2

A strategy and an initial top-level plan for a Department of Defense-wide Software Initiative to improve the state of practice in the U.S. DOD Community concerning the acquisition, management, development, and support of computer software for military systems are proposed. It proposes the overall objectives and includes steps to elaborate and refine the initial top-level plan. The initiative calls for cooperation among DOD elements, industry, and academia.
Author

N83-20604# Department of Defense, Washington, D. C. Office of Under Secretary of Defense, Research and Advanced Technology.
STRATEGY FOR A DOD SOFTWARE INITIATIVE. VOLUME 2: APPENDICES
Larry Druffel 1 Oct. 1982 228 p refs 2 Vol.
(AD-A121738) Avail: NTIS HC A11/MF A01 CSCL 09/2

Defense computer systems activities are summarized.
Author

N83-20605# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
LETS: AN EXPRESSIONAL LOOP NOTATION
Richard C. Waters Oct. 1982 67 p refs
(Contract N00014-80-C-0505; Grant NSF MCS-79-12179)
(AD-A122108; AI-M-680) Avail: NTIS HC A04/MF A01 CSCL 09/2

Many loops can be more easily understood and manipulated if they are viewed as being built up out of operations on sequences of values. A notation is introduced which makes this viewpoint explicit. Using it, loops can be represented as compositions of functions operating on sequences of values. A library of standard sequence functions is provided along with facilities for defining additional ones.
Author (GRA)

N83-20606# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
INCREMENTAL EXPRESSION PARSING FOR SYNTAX-DIRECTED EDITORS
Gail E. Kaiser and Elaine Kant 27 Oct. 1982 57 p refs
(Contract F33615-78-C-1551; ARPA Order 3597)
(AD-A122152; CMU-CS-82-141) Avail: NTIS HC A04/MF A01 CSCL 12/1

This document describes an algorithm for incremental parsing of expressions in the context of syntax-directed editors for programming languages. Since a syntax-directed editor represents programs as trees and statements and expressions as nodes in trees, making minor modifications in an expression can be difficult. To make these changes in a typical syntax-directed editor, the user must understand the tree structure and type a number of tree-oriented construction and manipulation commands. This document describes an algorithm that allows the user to think in terms of the syntax of the expression as it is displayed on the screen (in infix notation) rather than in terms of its internal representation (which is effectively prefix), while maintaining the benefits of syntax-directed editing. The time and space complexities of the modifications for each new token are linear in the depth of the syntax tree.
GRA

N83-20607# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
TAILORING SOFTWARE FOR MULTIPLE PROCESSOR SYSTEMS Ph.D. Thesis
Karsten Schwans 1 Oct. 1982 237 p refs
(Contract F33615-78-C-1551; ARPA Order 3597)
(AD-A122158; CMU-CS-82-137) Avail: NTIS HC A11/MF A01 CSCL 09/2

A programming environment for multiple processor applications, called the TASK system and the integration of policies and mechanisms for resource management into the TASK system are discussed. In TASK, application programs are written in terms of the abstractions offered by the operating system used for program execution. As a result, once an application program is written, its execution requires few additional efforts by the application's programmer. Programs are written in two languages. The TASK language, designed and implemented as part of this thesis, is used to describe the logical structure of an application program, and an existing, algorithmic language is employed to implement the application's algorithms. The construction of an executable version of an application from the TASK and algorithmic language programs is automated. Such construction includes automatic linking and loading as well as the automatic allocation of resources to the individual components of the application program. Programmers guide the allocation of hardware resources to program components by stating high-level directives in TASK programs.
Author

N83-20608# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Aeronautical Information Dept.
INTAHILS: AN INTERACTIVE ANALYTICAL HILL SHADING SYSTEM USING ENTROPY AS AN INFORMATION STATISTIC
Royal Webster and Harold Moellering (Ohio State Univ.) 1982 16 p refs Presented at the Am. Congr. of Surveying and Mapping/Am. Soc. of Photogrammetry Ann. Conv., Washington, 13-18 Mar. 1983
(AD-A122693) Avail: NTIS HC A02/MF A01 CSCL 09/4

The interactive computer mapping system, INTAHILS, allows the user to generate analytical shaded relief maps. Selected algorithms have been chosen to utilize Digital Terrain Matrix data and display the shaded relief image in a virtual map or softcopy format. Various commands are used to interactively edit or change the image by altering the illumination source angles in selected local areas of the map image. Specific topographic features may then be enhanced, resulting in a more informative visual impression of the terrain. The information statistic is measured numerically by calculating the entropy of the map information presented. The process thus allows for a maximization of information presented, while minimizing the subjective bias of the cartographer. Good man-machine communication principles were utilized, resulting in a convenient and user-friendly system.
GRA

N83-20609# SRI International Corp., Menlo Park, Calif. Computer Science Lab.
TACTICAL EXECUTIVE (TACEXEC): A REAL-TIME SECURE OPERATING SYSTEM FOR TACTICAL APPLICATIONS Final Report
Richard J. Feiertag, Karl N. Levitt, and P. M. Melliar-Smith Jul. 1979 152 p refs
(Contract DAAB07-76-C-0368; SRI Proj. 5545)
(AD-A122706) Avail: NTIS HC A08/MF A01 CSCL 09/2

This report describes the design of a computer operating system (TACEXEC) that supports applications in a tactical military environment. The outstanding features of the system are that it is secure in the military multilevel sense and that it assures real time response to external events. TACEXEC is described both informally and in a formal mathematical notation. Formal and

informal definitions of security and real time performance are given and techniques for proving that TACEXEC meets these requirements are described. Several issues with regard to the implementation of TACEXEC are also discussed. GRA

N83-20610# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
THE USE OF ASPEN IN THE ANALYSIS OF THERMODYNAMIC CYCLES
L. W. Fish, D. R. Evans, and W. W. Madsen 1982 9 p Presented at the Symp. on Computer-Aided Process Design and Simulation with ASPEN, Winter Natl. AICHE Meeting, Orlando, Fla., 28 Feb. - 3 Mar. 1982
(Contract DE-AC07-76ID-01570)
(DE82-008606; EGG-M-00682; CONF-820202-13) Avail: NTIS HC A02/MF A01

Analysis of the performance of low temperature binary Rankine cycles for electrical power generation and estimation of the cost of the required equipment are important technical areas. These functions were performed using separate computer program for all applications. In performing cycle analysis and cost estimation for the recovery of low temperature thermal energy from the Advanced Test Reactor (ATR), the ASPEN program is used, since it appears to have the required capabilities. DOE

N83-20611# Helsinki Univ. of Technology, Espoo (Finland). Dept. of Technical Physics.
THE DESIGN OF DIGITAL FILTERS USING COMPUTER AIDED METHODS
P. Arnio, I. Hartimo, O. Simula, and J. Skyttae 25 Jun. 1981 38 p refs
(PB83-101972; TKK-F-A454; ISBN-951-752-317-3; ISSN-0355-7790) Avail: NTIS HC A03/MF A01 CSCL 09B

The design of digital filters is cumbersome to be done by pen and paper. A collection of computer programs has been installed to form an effective design tool. It includes programs from various sources most of them being, however, accomplished within this project. Starting from the basic filter specifications it is possible to achieve the z-plane representation in various forms. Depending on the restrictions of the realization media parallel, cascaded, lattice, or state space form can be achieved. The resulting filter can be effectively simulated to obtain the amplitude, phase, and noise characteristics. Author (GRA)

N83-20612# Mitre Corp., McLean, Va.
SUMMARY OF RESPONSES TO THE SOFTWARE TECHNOLOGY INTIATIVE QUESTIONAIRE
Eric D. Siegel May 1982 157 p refs
(Contract F19628-82-C-0001)
(PB83-109660; MTR-82W00085) Avail: NTIS HC A08/MF A01 CSCL 09B

Responses to the Software Technology Initiative (STI) questionnaire are summarized. The STI is part of a comprehensive DoD software R&D effort to achieve order-of-magnitude improvements in software productivity, reliability, and maintainability for military systems. The questionnaire provided a means for respondents to suggest and rank software problem areas and possible STI thrusts. GRA

N83-20613# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
DIGITAL EQUIPMENT CORPORATION, DECSYSTEM-20 MODEL 2020 FORTRAN-20 VERSION 7
6 Apr. 1982 12 p
(PB83-104133; FCTC-82-131) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Digital Equipment Corporation FORTRAN-20 Version 7 running under the TOPS-20 Release 4 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Subset Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-20614# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
DIGITAL EQUIPMENT CORPORATION, DECSYSTEM-10 MODEL 1091 FORTRAN-10 VERSION 7
6 Apr. 1982 12 p
(PB83-104125; FCTC-82-130) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Digital Equipment Corporation FORTRAN-10 Version 7 running under the TOPS-10 Version 7.01 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Language FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-20615# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
STRATUS COMPUTER, INC. STRATUS/32 VOS COBOL RELEASE 1.2
10 Apr. 1982 16 p
(PB83-104117; FCTC-82-111) Avail: NTIS HC A02/MF A01 CSCL 09B

This FCTC Technical Report for the STRATUS COMPUTER, INC VOS COBOL Release 1.2 running under the VOS Release 1.2 provides a consolidated summary of the results obtained from the evaluation of the subject complier against the Low-Intermediate of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This technical report is made up of several sections showing all the discrepanices found - if any. A companion report Validation Summary Report FCTC-82-STR-110 provides information regarding the validation of the compiler as the April 10, 1982 level of Federal Standard COBOL (FIPS PUB 21-1). GRA

N83-20616# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
MICRO FOCUS LTD, CIS COBOL VERSION 4.5
31 Dec. 1981 52 p
(PB83-104109; OSD/FCTC-81-130) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the MICRO FOCUS LTD., CIS COBOL Version 4.5 running under the CP/M Version 2.2 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the descrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies by level/ module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. Author

N83-20617# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
COMPUTER SCIENCES CORPORATION UNIVAC 1100/80, CSTS 74 COBOL - COB241 Validation Summary Report
20 May 1982 74 p refs
(PB83-104497; OSD/FSTC-82/145) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Computer Sciences Corporation CSTS 74 COBOL - Version COB241 running under the CSTS II - Release SYS242 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB

21-1). The compiler was validated against the High level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. Author (GRA)

N83-20618# Federal Compiler Testing Center, Falls Church, Va. Federal Software Testing Center.
DIGITAL EQUIPMENT CORPORATION, PDP-11/44 PDP-11/COBOL VERSION 4.4
10 Jun. 1982 13 p
(PB83-104166; OSD/FSTC-82/171) Avail: NTIS HC A02/MF A01 CSCL 09B

This FCTC technical report for the Digital Equipment Corporation PDP-11 COBOL Version 4.4 running under the RSX-11M-Plus Version 2.0 provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the low-intermediate of the 1974 COBOL Standard (X3.23-174/FIPS PUB-21-1). This technical report is made up of several sections showing all the discrepancies found - if any. A companion report validation summary report OSD/FSTC-82/170 provides information regarding the validation of the compiler as the June 10, 1982 level of Federal Standard COBOL (FIPSPUB21-1). Author (GRA)

N83-20619# Federal Compiler Testing Center, Falls Church, Va. Federal Software Testing Center.
DIGITAL EQUIPMENT CORPORATION, VAX-11/780 VAX-11 FORTRAN VERSION 3.0
10 Jun. 1982 13 p
(PB83-104174; OSD/FSTC-82/174) Avail: NTIS HC A02/MF A01 CSCL 09B

This validation summary report (VSR) for the Digital Equipment Corporation VAX-11 FORTRAN Version 3.0 running under the VAX/VMS Version 3.0 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Full Language FORTRAN level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.32-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N83-20620# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
NORTHERN TELCOM, INC., NTI-585 NTI ACOBOL/3 RELEASE 3
15 May 1982 12 p
(PB83-104158; OSD/FSTC-82-141) Avail: NTIS HC A02/MF A01 CSCL 09B

This FCTC Technical Report for the NORTHERN TELCOM INC. NTI ACOBOL/3 Release 3 running under the NTI Release 4.1 provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Indexed I-O Level 1 of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This technical report is made up of several sections showing all the discrepancies found, if any. A companion report Validation Summary Report OSD/FSTC-82/140 provides information regarding the validation of the compiler as the Low Intermediate level of Federal Standard COBOL (FIPS PUB 21-1). Author (GRA)

N83-20621# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
DIGITAL EQUIPMENT CORPORATION, DECSYSTEM-20 MODEL 2060, FORTRAN-20 VERSION 7
6 Apr. 1982 12 p
(PB83-104141; FCTC-82-132) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Digital Equipment Corporation FORTRAN-20 Version 7 running under the TOPS-20 Release 5 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Subset Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. Author (GRA)

N83-20622# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
COMPUTER SCIENCES CORPORATION UNIVAC 1100/80, CSTS FORTRAN - FTN143
20 May 1982 13 p
(PB83-104588; OSD/FSTC-82-146) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Computer Sciences Corporation CSTS FORTRAN - Version FTN143 running under the CSTS II Release SYS242 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Language FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. Author (GRA)

N83-20623# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
IBM CORPORATION SERIES/1, VIRTUAL COBOL 5796-NPW 1.4
29 Mar. 1982 57 p
(PB83-104570; OSD/FCTC-82-125) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the IBM Corporation Virtual COBOL 5796-NPW Version 1.4 running under the Virtual COBOL Control Program Support System 5798-ZZB Version 1,2 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3,23-1974/FIPS PUB 21-1). The compiler was validated against the Low-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. Author (GRA)

N83-20624# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
CONVERGENT TECHNOLOGIES IWS 111, CT FORTRAN, VERSION 4.1
1 Feb. 1982 17 p
(PB83-104562; FCTC-81-142) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Convergent Technologies CT FORTRAN, Version 4.1 running under the CTOS CwsLfs, Version 6.1 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The complier was validated against the Subset Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. Author (GRA)

N83-20625# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.

CONVERGENT TECHNOLOGIES IWS 111, CT COBOL VERSION 4.0
1 Feb. 1982 57 p
(PB83-104554; OSD/FCTC-81-141) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Convergent Technologies CT COBOL, Version 4.0 running under the CTOS CwsLfs, Version 6.1 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. Author (GRA)

N83-20626# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
DIGITAL EQUIPMENT CORPORATION PDP-11/44, PDP-11 COBOL VERSION 4.4
10 Jun. 1982 47 p
(PB83-104547; OSD/FSTC-82-170) Avail: NTIS HC A03/MF A01 CSCL 09B

A consolidated summary of the results obtained from the validation of the subject compiler against the 1974 Cobol Standard (X3.23-1974/FIPS PUB 21-1) is provided. The compiler was validated against the Low-Intermediate level of FIPS PUB 21-1. An overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed is included. B.G.

N83-20627# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
STRATUS COMPUTER, INC. STRATUS/32, VOS COBOL RELEASE 1.2
10 Apr. 1982 57 p
(PB83-104513; OSD/FCTC-82-110) Avail: NTIS HC A04/MF A01 CSCL 09B

A consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1) is provided. The compiler was validated against the April, 10, 1982 level of FIPS PUB 21-1. An overview of the validation which lists all cateories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed is included. B.G.

N83-20628# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
NCR CORPORATION, NCR 19040, NCR IRX COBOL RELEASE 6.0
18 May 1982 13 p
(PB83-104505; OSD/FSTC-82-151) Avail: NTIS HC A02/MF A01 CSCL 09B

This FCTC Technical Report for the NCR Corporation NCR IRX Release 6.0 running under the NCR IRX Release 6.0 provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Indexed I-O, Level 1 of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This technical report is made up of several sections showing all the discrepancies found, if any. A companion report Validation Summary Report OSD/FSTC-82/150 provides information regarding the validation of the compiler as the Low Intermediate level of Federal Standard COBOL (FIPS PUB 21-1). Author (GRA)

N83-20629# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
MICRO FOCUS LTD LEVEL II COBOL V1.0
31 Dec. 1981 63 p
(PB83-104638; OSD/FCTC-81-131) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the MICRO FOCUS LTD. Level II COBOL V1.0 running under the CP/M/86 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X23-1974/FIPS PUB 21-1). The compiler was validated against the High Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. Author (GRA)

N83-20630# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
DIGITAL EQUIPMENT CORPORATION PDP-11/44, COBOL-81 VERSION 1.1
10 Jun. 1982 49 p
(PB83-104620; OSD/FSTC-82-173) Avail: NTIS HC A03/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the DIGITAL EQUIPMENT CORPORATION COBOL-81 Version 1.1 running under the RSX-11M-PLUS Version 2.0 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. Author (GRA)

N83-20631# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
C3, INCORPORATED C40 SYSTEM, C5 COBOL-75 VERSION 1.0
9 Apr. 1982 84 p
(PB83-104612; OSD/FCTC-81-105) Avail: NTIS HC A05/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the C3, incorporated C3 COBOL-75 Version 1.0 running under the Perkin-Elmer OS/32 Version 5.2 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed.Author (GRA)

N83-20632# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
NORTHERN TELCOM INC. NTI-585, NTI ACOBOL/3
15 May 1982 56 p
(PB83-104604; OSD/FSTC-82-140) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (USR) for the NORTHERN TELCOM INC. NTI ACOBOL/3 Release 3 running under the NTI Release 4.1 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies by level/

module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. Author (GRA)

N83-20633# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
NCR CORPORATION, NCR 19040, NCR IRX COBOL RELEASE 6.0
18 May 1982 57 p
(PB83-104596; OSD/FSTC-82-150) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the NCR Corporation NCR IRX COBOL Release 6.0 running under the NCR IRX Release 6.0 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. Author (GRA)

N83-19773*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Deep Space Network Data Systems Section.
STAFFING IMPLICATIONS OF SOFTWARE PRODUCTIVITY MODELS
R. C. Tausworthe *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 70-77 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 09B

N83-20270# Warsaw Technical Univ. (Poland).
DEDUCTIVE FAULT-SIMULATION TECHNIQUE FOR NONPROCEDURAL COMPUTER HARDWARE DESCRIPTION LANGUAGES
K. Sapiecha, E. Szczesny, and K. Walczak *In* ESA Reliability and Maintainability Sep. 1982 657-661 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20275# Laboratoire d'Automatique et d'Analyse des Systemes, Toulouse (France).
SOFTWARE OPERATIONAL FUNCTIONAL RELIABILITY [SUR LA SURETE DE FONCTIONNEMENT OPERATIONNELLE DES LOGICIELS]
J. C. Laprie *In* ESA Reliability and Maintainability Sep. 1982 p 693-700 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

62 COMPUTER SYSTEMS

Includes computer networks.

N83-20634*# National Aeronautics and Space Administration. Pasadena Office, Calif.
MULTICOMPUTER COMMUNICATION SYSTEM Patent Application
Anil K. Agrawal (JPL, California Inst. of Tech., Pasadena), Philip G. Mullen (JPL, California Inst. of Tech., Pasadena), and Vivatvong V. Vadakan, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 4 Apr. 1981 32 p Sponsored by NASA
(NASA-Case-NPO-15433-1; US-Patent-Appl-SN-250585) Avail: NTIS HC A03/MF A01 CSCL 09B

A local area network is provided for a plurality of autonomous computers which operate at different rates and under different protocols coupled by network bus adapters to a global bus. A host computer (HC) divides a message file to be transmitted into blocks, each with a header that includes a data type identifier and a trailer. The associated network bus adapter (NBA) then divides the data into packets, each with a header to which a transport header and trailer is added with frame type code which specifies one of three modes of addressing in the transmission of data, namely a physical address mode for computer to computer transmission using two bytes for source and destination addresses, a logical address mode and a data type mode. NASA

N83-20635# Naval Postgraduate School, Monterey, Calif. Dept. of Computer Science.
IMPLEMENTATION OF A REAL-TIME, DISTRIBUTED OPERATING SYSTEM FOR A MULTIPLE COMPUTER SYSTEM M.S. Thesis
Stephen Graham Klinefelter Jun. 1982 172 p refs
(AD-A121878) Avail: NTIS HC A08/MF A01 CSCL 09/2

This thesis presents extensions to an implementation of a kernel in a real-time distributed operating system for a microcomputer based multiprocessor system. The operating system, MCORTEX, is a 2 level, hierarchically structured loop free, system that permits logical distribution of the kernel in the address space of each process. The design is based on segmented address spaces and per process stacks. Process synchronization is achieved through sequencers and eventcounts. MCORTEX is resident in the local memory of each microcomputer but system data is maintained in shared global memory. MCORTEX has been extended to include a system monitor process which allows stopping the system to examine any memory, shared or local, from any location. The system can then be restarted without reinitializing each microcomputer. This system particularly supports applications where jots are partitioned into a set of multiple interacting asynchronous processes. The system is currently implemented on INTEL 86/12A single-board computers.
Author (GRA)

N83-20223# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse des Systemes.
INFLUENCE OF TEMPORARY FAULTS ON THE AVAILABILITY OF COMPUTER SYSTEMS [INFLUENCE DES FAUTES TEMPORAIRES SUR LA DISPONIBILITE DES SYSTEMES INFORMATIQUES]
J. C. Laprie and A. M. Legwinski *In* ESA Reliability and Maintainabilaity Sep. 1982 p 319-326 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N83-20636*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CANONICAL FORMS FOR NONLINEAR SYSTEMS
Renjeng Su, L. R. Hunt (Texas Tech Univ.), and George Meyer Feb. 1983 31 p refs
(NASA-TM-81323; A-8990; NAS 1.15:81323) Avail: NTIS HC A03/MF A01 CSCL 09B

Necessary and sufficient conditions for transforming a nonlinear system to a controllable linear system have been established, and this theory has been applied to the automatic flight control of aircraft. These transformations show that the nonlinearities in a system are often not intrinsic, but are the result of unfortunate choices of coordinates in both state and control variables. Given a nonlinear system (that may not be transformable to a linear system), we construct a canonical form in which much of the nonlinearity is removed from the system. If a system is not transformable to a linear one, then the obstructions to the transformation are obvious in canonical form. If the system can be transformed (it is called a linear equivalent), then the canonical

form is a usual one for a controllable linear system. Thus our theory of canonical forms generalizes the earlier transformation (to linear systems) results. Our canonical form is not unique, except up to solutions of certain partial differential equations we discuss. In fact, the important aspect of this paper is the constructive procedure we introduce to reach the canonical form. As is the case in many areas of mathematics, it is often easier to work with the canonical form than in arbitrary coordinate variables.
Author

N83-20637# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
DATA-DRIVEN AND EXPECTATION-DRIVEN DISCOVERY OF EMPIRICAL LAWS Interim Report, Feb. - Oct. 1982
Patrick W. Langley, Gary L. Bradshaw, and Herbert A. Simon 10 Oct. 1982 18 p refs
(Contract N00014-82-K-0168)
(AD-A120950; CMU-RI-TR-1; CIP-WP-433) Avail: NTIS HC A02/MF A01 CSCL 09/2

BACON.5 is a program that discovers empirical laws for summarizing data. The system incorporates four data-driven heuristics for relating numeric terms, recursing to higher levels of description, postulating intrinsic properties such as mass and specific heat, and finding common divisors. BACON.5 also includes expectation-driven strategies for directing search based on discoveries that the program has already made. These include heuristics for expecting similar forms of laws, reducing the amount of data that must be gathered, and taking advantage of the symmetrical form of some laws. BACON.5 has shown its generality by rediscovering a number of laws from the history of physics and chemistry, including Snell's law of refraction, conservation of momentum, and Black's specific heat law. GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N83-20638*# Ohio State Univ., Columbus. Dept. of Mechanical Engineering.
EVALUATION OF TRUNCATION ERROR AND ADAPTIVE GRID GENERATION FOR THE TRANSONIC FULL POTENTIAL FLOW CALCULATIONS
S. Nakamura Feb. 1983 38 p refs
(Contract NCA2-OR-565-101)
(NASA-CR-166452; NAS 1.26:166452) Avail: NTIS HC A03/MF A01 CSCL 12A

The effects of truncation error on the numerical solution of transonic flows using the full potential equation are studied. The effects of adapting grid point distributions to various solution aspects including shock waves is also discussed. A conclusion is that a rapid change of grid spacing is damaging to the accuracy of the flow solution. Therefore, in a solution adaptive grid application an optimal grid is obtained as a tradeoff between the amount of grid refinement and the rate of grid stretching. M.G.

N83-20639# Argonne National Lab., Ill. Applied Mathematics Div.
DISPERSIVE APPROXIMATIONS FOR HYPERBOLIC CONSERVATION LAWS Ph.D. Thesis
Bradley J. Lucier Dec. 1981 60 p refs
(Contract W-7405-eng-38)
(ANL-81-74) Avail: NTIS HC A04/MF A01

Necessary and sufficient conditions are given so that the Sobolev-type partial differential equation (S) generates a contraction semigroup on L1(R). It is shown that any nonlinear contraction from L1(R) to itself that preserves the integral and commutes with translations satisfies maximum and minimum principles. This lemma is applied to the solution operator S sub T of (S) to give necessary and sufficient conditions that S sub T satisfy a maximum principle, despite the dispersive nature of (S). Sufficient conditions are given so that the solutions of (S) converge, as Nu and Beta tend to zero, to the entropy solution of the conservation law u sub T + F(u) sub x = 0, x is a member of R, T >), u(x,o) = u sub 0 (x), x is a member of R. A larger class of monotone finite difference schemes for the numerical solution of the conservation law, motivated by finite difference discretizations of (S), is introduced, and convergence results are proved for methods in this class. The methods analyzed include some that were previously used to approximate the solution of a linear waterflood problem in petroleum engineering. M.G.

N83-20640# Argonne National Lab., Ill. Applied Mathematics Div.
IMPROVING THE ACCURACY OF COMPUTED SINGULAR VALUES
J. J. Dongarra Jan. 1982 14 p refs
(Contract W-31-109-eng-38)
(ANL-82-4) Avail: NTIS HC A02/MF A01

A computational method for improving the accuracy of a given singular value and its associated left and right singular vectors is described. The method is analogous to iterative improvement for the solution of linear systems. That is, by means of a low-precision computation, an iterative algorithm is applied to increase the accuracy of the singular value and vectors; extended precision computations are used in the residual calculation. The method is related to Newton's method applied to the singular value problem and inverse iteration for the eigenvalue problem. M.G.

N83-20641# Florida State Univ., Tallahassee. Dept. of Statistics.
A CHARACTERIZATION OF INDEPENDENCE IN A FAMILY OF DISTRIBUTIONS EXHIBITING CERTAIN POSITIVE OR NEGATIVE DEPENDENCE
Joag-Dev Kumar (Illinois Univ.) Sep. 1982 9 p refs
(Contract F49620-82-K-0007; Grant AF-AFOSR-0007-82; AF Proj. 2304)
(AD-A121478; FSU-STATISTICS-M640; AFOSR-82-152TR; AFOSR-82-0923TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A characterization of independence via uncorrelatedness is shown to hold for a family exhibiting positive dependence, wider than the one containing associated random variables. This generalizes a result of Newman and Wright (1981 Ann. Prob.) for associated random variables. In fact the weakening of the positive dependence condition naturally leads to a more direct and simple proof of the characterization. It also yields the same characterization for a family possessing an analogous negative dependence condition.
Author (GRA)

N83-20642# Louisiana State Univ., Baton Rouge. Lab. of Remote Sensing and Image Processing.
A STUDY OF TEXTURE ANALYSIS ALGORITHMS Annual Report, 1 Mar. 1981 - 30 Apr. 1982
Charles A. Harlow and Richard W. Conners 28 May 1982 100 p refs
(Grant AF-AFOSR-0112-81; AF Proj. 2304)
(AD-A121465; AFOSR-82-0973TR) Avail: NTIS HC A05/MF A01 CSCL 17/8

This research has focused upon developing improved texture analysis algorithms. Work performed has shown that the Spatial Gray Level Dependence (SGLDM) texture analysis algorithm is a superior algorithm. Tiling theory has been utilized to extend texture concepts and to develop a structural analysis (SSA) system for texture patterns. The commonly used measures have shown to be inadequate. A mathematical theory has been developed within which to generate new texture measures related to perceptual features. An image segmentation procedure is being investigated which incorporates the authors' theory on texture analysis. Complex natural scenes have been analyzed and substantiate the theory developed. GRA

N83-20643# Stanford Univ., Calif. Dept. of Statistics.
SOME FURTHER APPLICATIONS OF FINITE DIFFERENCE OPERATORS

Kai-Tai Fang Sep. 1982 16 p refs
(Contract DAAG29-82-K-0156)
(AD-A120908; SU-TR-3; ARO-19065.2-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

R.F. Link described a standard method of deriving the moments of the better-known discrete probability distribution functions by using finite difference operators. In this report these formulas are used to derive the moments of some basic distributions in occupancy problems and other known discrete distributions. GRA

N83-20644# Stanford Univ., Calif. Optimization Lab.
A FAST ALGORITHM THAT MAKES MATRICES OPTIMALLY SPARSE
Alan J. Hoffman and S. Thomas McCormick Sep. 1982 16 p refs Presented at the Silver Jubilee Conf. in Combust., Waterloo, Ontario, 14 Jun. - 2 Jul. 1982
(Contracts N00014-75-C-0267; DAAG29-79-C-0110; DE-AM03-76SF-00326; DE-AT03-76ER-72018)
(AD-A120902; SOL-82-13; ARO-16470.17-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

Under a non-degeneracy assumption on the non-zero entries of a given sparse matrix, a polynomially-bounded algorithm is presented that performs row operations on the given matrix which reduce it to a sparsest possible matrix with the same row space. For each row of the matrix, the algorithm performs a maximum cardinality matching on the bipartite graph associated with a submatrix which is induced by that row. The dual of the optimal matching then species the row operations that will be performed on that row. Also described is a variant algorithm that processes the matrix in place, thus conserving storage and time. The modifications needed to apply the algorithm to matrices that do not necessarily satisfy the non-degeneracy assumption are also described. A particularly promising application of this algorithm is in the reduction of linear constraint matrices. Author (GRA)

N83-20645# Wisconsin Univ., Madison. Mathematics Research Center.
ON THE RELATIONSHIP BETWEEN THE LOGARITHMIC STRAIN RATE AND THE STRETCHING TENSOR Technical Summary Report
Morton E. Gurtin and Kathleen Spear Jun. 1982 36 p refs
(Contract DAAG29-80-C-0041)
(AD-A120958; MRC-TSR-2399) Avail: NTIS HC A03/MF A01 CSCL 12/1

Experimentalists often report strain data using logarithmic measures of strain, and these measures have also been utilized extensively for theoretical purposes in the recent engineering literature. This logarithmic strain measures has been shown to have certain advantages in the formulation of the deformation theory of plasticity. The purpose of this paper is to extend the formula to arbitrary three-dimensional deformations. GRA

N83-20646# Wisconsin Univ., Madison. Mathematics Research Center.
ON THE CROSSING RULE
S. Friedland (Hebrew Univ.), J. W. Robbin, and J. H. Sylvester Jun. 1982 36 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)
(AD-A120957; MRC-TSR-2398) Avail: NTIS HC A03/MF A01 CSCL 12/1

The paper gives conditions on a family of matrices which guarantee that some matrix in the family will have a multiple eigenvalue. In particular, the main theorem states exactly which dimensions admit k dimensional subspaces of matrices for which all nonzero elements have distinct eigenvalues. This question arises naturally in the theory of first order hyperbolic systems of partial differential equations; the main theorem, in this context, tells exactly for which integers n an n x n system in k space variables may be strictly hyperbolic. GRA

N83-20647# Rensselaer Polytechnic Inst., Troy, N. Y.
ANALYTIC INVESTIGATION OF FREE BOUNDARY PROBLEMS Final Report, 1 Jun. 1975 - 30 Jul. 1982
Bernard A. Fleishman Nov. 1982 5 p refs
(Contracts DAAG29-75-C-0021; DAAG29-79-C-0012)
(AD-A121945; ARO-13081.5-MA; ARO-16173.5-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

We have investigated a number of nonlinear boundary value problems, usually steady-state, of reaction-diffusion type. Though a few problems have involved ordinary differential equations, we have been concerned mostly with elliptic partial differential equations. Of special interest have been nonlinearities with jump discontinuities in the dependent variable, giving rise to free boundaries. Author (GRA)

N83-20648# Texas Inst. for Computational Mechanics, Austin. Dept. of Aerospace Engineering and Engineering Mechanics.
COMPUTATIONAL METHODS IN NONLINEAR MECHANICS Final Report, 30 Jun. 1980 - 30 Sep. 1982
J. Tinsley Oden Sep. 1982 173 p refs
(Contract F49620-78-C-0083; AF Proj. 2307)
(AD-A121821; TICOM-82-6; AFOSR-82-0989TR) Avail: NTIS HC A08/MF A01 CSCL 12/1

This document is the final technical report for the project, computational Methods in Nonliner Mechanics. The Report summarizes results obtained on this project for the period June 30, 1980 through September 30, 1982. All objectives of the original statement of work have been accomplished. These have incuded advances in mathematical modelling, numerical analysis, approximation theory, development of computer codes, and the study of related issues connected with the following nonlinear structual problems: contact problems in elasticity, reduced integration and penalty methods for finite element approximations of constrained problems in elasticity and fluid flow, contact problems with friction, nonlinear friction laws, plasticity and metal forming, existence and approximation theories in contract problem in elastostatics, fracture mechanics numerical methods for problems of finite elastic deformation, nonlinear eigenvaue problems, and bifurcation theory. Detailed summaries of results in some of these areas are given together with lists of all papers, reports, books, dissertations and oral presentations produced during the contract period. Suggestions for further research areas are also given. GRA

N83-20649# Wisconsin Univ., Madison. Mathematics Research Center.
BIVARIATE BOX SPLINES AND SMOOTH pp FUNCTIONS ON A THREE DIRECTION MESH
C. deBoor and K. Hoellig Aug. 1982 37 p refs
(Contract DAAG29-80-C-0041)
(AD-A120989; MRC-TSR-2415) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report investigates the use of translates of certain bivariate box-splines in the construction of a unified theory for piecewise polynomial functions on regular meshes. A simple mesh is considered, derived from a square mesh by drawing in the same diagonal into every square. The space S of piecewise polynomial functions of a given degree and smoothness, and with discontinuities (in some derivative) only across lines of that mesh is considered. We show that the box splines and their translates provide a basis for the local part of S and use the techniques of (BH sub 1) to analyse the approximation properties of S. The report stresses the importance of local support bases which are desirable for applications such as finite element methods, smoothing of data and approximation in general. Our results should be useful for the further investigation of smooth piecewise polynomials, in particular on regular meshes (c.f. (CW), (Si), S1) for related work. GRA

N83-20650# Florida State Univ., Tallahassee. Dept. of Statistics.
TESTING HYPOTHESIS WHICH ARE UNIONS OF LINEAR SUBSPACES
Roger L. Berger and Dennis F. Sinclair Sep. 1982 22 p refs
(Contract DAAG29-79-C-0158)
(AD-A121470; FSU-Statistics-M-639; D-55-ARO; ARO-16713.22-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

The likelihood ratio test (LRT) for hypotheses which are unions of linear subspaces is derived for the normal theory linear model. A more powerful variant of the LRT is proposed for the case in which the subspaces are not all of the same dimension. A theorem is proved which may be used to identify hypotheses which are unions of linear subspaces. Some hypotheses, of particular relevance in ecology, concerning the spacings between normal means are shown to be unions of linear subspaces and are therefore testable using the LRT. Finally, the computation of the LRT statistic is discussed. Author (GRA)

N83-20651# Massachusetts Univ., Amherst. Dept. of Electrical and Computer Engineering.
ANOTHER APPROACH TO GENERIC POLE ASSIGNMENT
Theodore E. Djaferis Jul. 1982 9 p refs
(Grant AF-AFOSR-0155-80; AF Proj. 2304)
(AD-A121364; AFOSR-82-0967TR) Avail: NTIS HC A02/MF A01 CSCL 09/3

The problem of assigning the closed loop poles of a linear time-invariant multi-variable system using a proper linear, time invariant, output feedback compensator continues to be of great interest. Even though several issues remain unresolved, good progress has been made, as evidenced by the interesting work of many researchers (see references). GRA

N83-20652# Illinois Univ., Chicago. Dept. of Mathematics.
DESIGN OF EXPERIMENTS AND RELIABILITY MODELS Final Scientific Report, 1 Jun. 1981 - 31 Jul. 1982
A. S. Hedayat Aug. 1982 4 p refs
(Grant AF-AFOSR-0170-80; AF Proj. 2304)
(AD-A121346; AFOSR-82-0930TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report summarizes the results of research under the grant during the period 1 June 1981 to 31 July 1982. The report lists published papers and reports, both in the area of design of experiments and in reliability. Also reported on are conferences attended and presentations made, and a brief summary of results. Author (GRA)

N83-20653*# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
ANALYTICAL REDUNDANCY AND THE DESIGN OF ROBUST FAILURE DETECTION SYSTEMS
Edward Y. Chow (Schlumberger-Doll Research) and Alan S. Willsky 14 Oct. 1982 52 p refs Submitted for publication
(Grant NGL-22-009-124; Contract N00014-77-C-0224; NR Proj. 041-510)
(NASA-CR-170006; NAS 1.26:170006; AD-A121771; LIDS-P-1253) Avail: NTIS HC A04/MF A01 CSCL 12A

The Failure Detection and Identification (FDI) process is viewed as consisting of two stages: residual generation and decision making. It is argued that a robust FDI system can be achieved by designing a robust residual generation process. Analytical redundancy, the basis for residual generation, is characterized in terms of a parity space. Using the concept of parity relations, residuals can be generated in a number of ways and the design of a robust residual generation process can be formulated as a minimax optimization problem. An example is included to illustrate this design methodology. GRA

N83-20654# Massachusetts Univ., Amherst. Dept. of Mathematics and Statistics.
MONOTONE EQUIVARIANT SEGMENTATION TECHNIQUES
M. F. Janowitz Sep. 1982 46 p refs
(Contract N00014-79-C-0629)
(AD-A121418; TR-J8201) Avail: NTIS HC A03/MF A01 CSCL 12/1

An earlier model for nonhierarchial clustering is extended so that it encompasses the original image segmentation problem. A theoretical discussion within this model is provided for certain segmentation techniques. The discussion is also carried out within the framework of a Bernouli process. The techniques are illustrated on real and simulated data. Author (GRA)

N83-20655# Massachusetts Univ., Amherst. Dept. of Electrical and Computer Engineering.
SOME GENERIC INVARIANT FACTOR ASSIGNMENT RESULTS USING DYNAMIC OUTPUT FEEDBACK
T. E. Djaferis and S. K. Mitter Jul. 1982 36 p refs
(Grant AF-AFOSR-0155-80; AF Proj. 2304)
(AD-A121409; AFOSR-82-0966TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Working with input-output transfer functions in the frequency domain and exploiting a formulation involving Generalized Sylvester Resultants, the authors are able to derive necessary and sufficient conditions for generic invariant factor assignment, in several cases, using proper dynamic output feedback compensators. Author (GRA)

N83-20656# Utah Univ., Salt Lake City.
NUMERICAL SOLUTION OF INVERSE PROBLEMS Final Report, 15 Sep. 1980 - 14 Sep. 1982
Frank Stenger 13 Nov. 1982 8 p refs
(Contract DAAG29-80-K-0089)
(AD-A122101; ARO-17533.5-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

It was proposed to derive efficient 3 dimensional numerical algorithms for inversion of model equations: in geophysics, for underground detection; and in ultrasonic tomography, for accurate image reconstruction of a part of the interior of a human being. Author (GRA)

N83-20657# Wisconsin Univ., Madison. Dept. of Statistics.
CROSS VALIDATED SPLINE METHODS FOR DIRECT AND INDIRECT SENSING EXPERIMENTS Scientific Interim Report
Grace Wahba Oct. 1982 16 p refs Submitted for publication
(Contract N00014-77-C-0675)
(AD-A122151; TR-694) Avail: NTIS HC A02/MF A01 CSCL 12/1

We first give an overview of cross-validated smoothing spline methods for the analysis of data from direct and indirect sensing experiments. Then we summarize some results involving two particular applications of the approach: (1) a deconvolution problem with nonnegativity constraints on the solution; (2) estimation of horizontal divergence and vorticity from discrete, scattered, global measurements of the upper air wind field. GRA

N83-20658# Florida Univ., Gainesville. Dept. of Electrical Engineering.
ALGEBRAIC THEORY OF LINEAR TIME-VARYING SYSTEMS AND LINEAR INFINITE-DIMENSIONAL SYSTEMS Final Report, 1 Feb. 1978 - 31 Aug. 1981
Edward W. Kamen Nov. 1982 6 p refs
(Contract DAAG29-80-K-0076; Grant DAAG29-78-G-0063)
(AD-A122134; ARO-13162.10-MA; ARO-17589.3-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

The research centered on two major classes of linear systems: linear time-varying systems and linear infinite-dimensional systems. A brief description of the work which has been carried out on each class of systems is given. GRA

N83-20659# Naval Postgraduate School, Monterey, Calif. Dept. of Computer Science.
TOP-DOWN SYNTHESIS OF SIMPLE DIVIDE AND CONQUER ALGORITHMS
Douglas R. Smith Nov. 1982 102 p refs
(Contract N00014-82-WR-20043; RR0000110)
(AD-A122126; NPS52-82-011) Avail: NTIS HC A06/MF A01 CSCL 09/2

A new method is presented for the deductive synthesis of computer programs. The method takes as given a formal specification of a user's problem. The specification is allowed to be incomplete in that some or all of the input conditions may be omitted. A completed specification plus a computer program are produced by the method. Synthesis involves the top-down decomposition of the user's problem into a hierarchy of subproblems. Solving each of these subproblems results in the synthesis

of a hierarchically structured program. The program is guaranteed to satisfy the completed specification and to terminate on all legal inputs. In this paper we present a framework for a top-down synthesis process, explore the structure of a class of divide and conquer algorithms, and present a method for the top-down synthesis of algorithms in this class. Detailed derivations of four sorting algorithms are presented. GRA

N83-20660# UTE Research Labs., Fort Duchesne, Utah. Dept. of Chemical Engineering.
PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON STIFF COMPUTATION, VOLUME 1
Richard C. Aiken 1982 187 p refs Conf. held in Park City, Utah, 12-14 Apr. 1982 3 Vol.
(Grant AF-AFOSR-0038-82; AF Proj. 1204)
(AD-A122169; AFOSR-82-1036TR-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 12/1

These volumes constitute the written contributions of speakers at the International Conference on Stiff Computation, held April 12-14, 1982 at Park City, Utah. The purpose of this meeting was to bring together theorists, software developers, and users on common ground to consider the state of the art - and practice - of stiff computation. Volume 1 consists of: (1) Stiff Review 1974-1982; I. Applications; (2) Stiff Review 1974-1982; II. Packages; and (3) Stiff Review 1974-1982; III. Theory (Listing). GRA

N83-20661# UTE Research Labs., Fort Duchesne, Utah. Dept. of Chemical Engineering.
PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON STIFF COMPUTATION, VOLUME 2
Richard C. Aiken 1982 449 p refs Conf. held in Park City, Utah, 12-14 Apr. 1982 3 Vol.
(Grant AF-AFOSR-0038-82; AF Proj. 2304)
(AD-A122170; AFOSR-82-1036TR-Vol-2) Avail: NTIS HC A19/MF A01 CSCL 12/1

These three volumes constitute the written contributions of speakers at the International Conference on Stiff Computation, held April 12-14, 1982, at Park City, Utah. The purpose of this meeting was to bring together theorists, software developers, and users on common ground to consider the state of the art, and practice, of stiff computation. Partial contents include: (1) what is stiffness?; (2) notes on partitioning in the solution of stiff equations; (3) another view of stiff differential systems; (4) stiff ordinary differential equations in chemical process analysis; (5) numerical integration of stiff differential/algebraic equations with severe discontinuities; (6) an overview of the highly oscillatory initial value problem; (7) Riccati type transformations and decoupling of singularly perturbed ode; (8) stiffly stable linear multistep methods; (9) some comments on stability and error analysis for stiff nonlinear problems; and (10) contractivity of multistep and one-leg methods with variable steps. GRA

N83-20662# UTE Research Labs., Fort Duchesne, Utah. Dept. of Chemical Engineering.
PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON STIFF COMPUTATION, VOLUME 3
Richard C. Aiken 1982 317 p refs Conf. held in Park City, Utah, 12-14 Apr. 1982 3 Vol.
(Grant AF-AFOSR-0038-82; AF Proj. 2304)
(AD-A122171; AFOSR-82-1036TR-Vol-3) Avail: NTIS HC A14/MF A01 CSCL 12/1

These three volumes consititute the written contributions of speakers at the International Conference on Stiff Computation, held April 12-14, 1982, at Park City., Utah. The purpose of this meeting was to bring together theorists, software developers, and users on common ground to consider the state of the art - and practice - of stiff computation. Partial contents include: (1) Pitfalls in the Comparison of Numerical Methods for Stiff Ordinary Differential Equations; (2) An Advanced Simulation Package for Large Chemical Reaction Systems; (3) Chemical Kinetics - An Overview from the Point of View of Numerical Analysis and Software Implementation; (4) An Overview of Stiffness Problems in Nuclear Reactor Kinetics; (5) The Solution of Several Representative Stiff Problems in an Industrial Environment: The Evolution of an O.D.E. Solver; (6) Multirate Integration Algorithms Applied to Stiff Systems in Nuclear Power Plant Simulation; (7) Applications of Perturbed Functional Iterations to Nonlinear Stiff Initial Value Chemical Kinetic Problems; (8) Nonlinear Sensitivity Analysis in Chemical Kinetics--the Scaled Green's Function Method; and (9) Some Experiences in the Selection of Integrators for Large-Scale Ode Problems in Chemical Engineering. GRA

N83-20663# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
THE POWER OF TRIANGULATION: APPLICATIONS TO PROBLEMS OF VISIBILITY AND INTERNAL DISTANCE
Bernard Chazelle Mar. 1982 24 p refs
(Contract F33615-81-K-1539; ARPA Order 3597)
(AD-A122157; CMU-CS-82-121) Avail: NTIS HC A02/MF A01 CSCL 12/1

It is well-known that the complexity of performing operations on a set depends heavily on the structure which we are allowed to put into its representation. For example, searching through a sequence of numbers can be performed more efficiently if the numbers appear in sorted order. In this paper, we take, as a case-study, the class of problems involving a simple N-gon P and, making the assumption that in addition to the usual description of the boundary of P, an arbitrary triangulation is also available, we investigate the computational power gained from having this additional information. Among other results, we give a very simple, optimal algorithm for computing the area visible from an arbitrary point in P. We also present several optimal algorithms for computing the internal distance between two points in P. Recall that the internal distance between A and B is defined as the length of the shortest path inside P between A and B. GRA

N83-20664# State Univ. of New York, Binghamton. Dept. of Mathematical Sciences.
ON CUMULATIVE SUM PROCEDURES AND A STOPPED WIENER PROCESS FORMULA
Rasul A. Khan and Shelley Zacks 2 Oct. 1982 21 p refs
(Contract N00014-81-K-0407; NR Proj. 042-276)
(AD-A122215; TR-5) Avail: NTIS HC A02/MF A01 CSCL 12/1

For detecting changes in mu three types of cumulative sum (cusum) procedures are considered. The first one is a class of cusum-type procedures tau such that E sub 0 TAU = + infinity and E sub mu TAU less than infinity for mu greater than 0. The second is a modification of the conventional cusum procedure of Page (1954) which is more efficient. The third is a continuous version T of the modified cusum procedure in terms of Wiener process and its LaPlace transform is found which leads to the known results of Taylor (1975) and Nadler and Robbins (1971). GRA

N83-20665# Lehigh Univ., Bethlehem, Pa. Dept. of Mechanical Engineering and Mechanics.
IMPROVED SECOND ORDER METHODS FOR PARABOLIC PARTIAL DIFFERENTIAL EQUATIONS Interim Technical Report
W. C. Lee and J. D. A. Walker Apr. 1982 104 p refs
(Contract F49620-78-C-0071; AF Proj. 2307)
(AD-A122197; TR-FM-82-2; AFOSR-82-1034TR) Avail: NTIS HC A06/MF A01 CSCL 12/1

Two new finite difference for the calculation of parabolic partial differential equations. The leading truncation error terms are derived and detailed comparisons are made with the errors associated with existing methods, namely the Crank-Nicolson method and Keller Box scheme. A number of examples of both linear and non-linear parabolic problems are computed with both the new and also the existing methods. The accuracy of all four methods are compared; based on the computational experiments and a comparison of the magnitudes of the leading truncation errors, it is concluded that the improved methods are to be preferred over the existing methods. GRA

N83-20666# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A METHOD OF EVALUATING LAPLACE TRANSFORMS WITH SERIES OF COMPLETE OR INCOMPLETE BETA FUNCTIONS
Alexander S. Elder and Emma M. Wineholt Dec. 1982 35 p refs
(DA Proj. 1L1-61102-AH-43)
(AD-A122253; AD-F300141; ARBRL-TR-02450) Avail: NTIS HC A03/MF A01 CSCL 12/1

In a previous paper factorial series were used to calculate ordinary and modified Bessel functions of the second kind. In the present paper the factorial series is generalized so that Laplace integrals in which the integrand has a branch point at the origin are represented by a series of beta functions. To effect the required transformation, formulas for calculating Stirling numbers of fractional order were derived; these were used in the same manner as the Stirling numbers of integer order are used to calculate the coefficients of a factorial series. Formulas for calculating Ko(x) and Kl(x) have been derived and programmed, using these modified Stirling numbers. Formulas for calculating Io(x) and Il(x) have been derived and programmed using series of incomplete beta functions in a similar algorithm. Results agree to thirteen significant figures for Ko(x) and Kl(x) when $x > 8$ and for Io(x) when $x > 15$. The modified Stirling numbers increase very slowly with order and index since gamma functions do not occur in the definition. Consequently no problems with overrun of the electronic computer occurred during the course of the calculations. GRA

N83-20667# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
ITERATIVE ALGORITHMS FOR OPTIMAL SIGNAL RECONSTRUCTION AND PARAMETER IDENTIFICATION GIVEN NOISY AND INCOMPLETE DATA Ph.D. Thesis
Bruce Ronald Musicus Sep. 1982 466 p refs
(Contract N00014-81-K-0742; Grant NSF ECS-80-07102; NR Proj. 049-506)
(AD-A122249; TR-496) Avail: NTIS HC A20/MF A01 CSCL 12/1

Presented is a new approach to the problem of estimating multiple unknown signals and/or parameters from noisy and incomplete data. The various unknowns are stochastically independent, then fitted into separable probability density approximation to the given model density by minimizing the cross-entropy. Given the separable density, all the unknowns can then be estimated independently of each other using conventional methods. Surprisingly, all the well known Maximum A Posteriori and Maximum Likelihood methods for this problem can be viewed as degenerate forms of this cross-entropy approach, in which one or more components of the fitted separable density are constrained to be impulse functions. The Minimum Cross-Entropy and MAP separable density approximations by iteratively minimizing with respect to each unknown component of the density are solved. This iterative approach takes a particularly simple form when the probability densities belong to an exponential class of densities. Each iteration decreases the cross-entropy, and convergence can be proven under mild conditions. GRA

N83-20668# Los Alamos Scientific Lab., N. Mex.
FAST ALGORITHM FOR TWO-DIMENSIONAL DATA TABLE USE IN HYDRODYNAMIC AND RADIATIVE-TRANSFER CODES
W. L. Slattery and W. H. Spangenberg 1982 16 p Presented at the Sci., Eng. and the Cray-1 Symp., Minneapolis, 5 Apr. 1982; sponsored by Cray Research, Inc.
(Contract W-7405-eng-36)
(DE82-011983; LA-UR-82-656; CONF-820433-1) Avail: NTIS HC A02/MF A01

A fast algorithm for finding interpolated atomic data in irregular two-dimensional tables with differing materials is described. The algorithm is tested in a hydrodynamic/radiative transfer code and shown to be of comparable speed to interpolation in regularly spaced tables, which require no table search. The concepts presented are expected to have application in any situation with irregular vector lengths. Also, the procedures that were rejected either because they were too slow or because they involved too much assembly coding are described. DOE

N83-20669# Sandia Labs., Albuquerque, N. Mex.
ESTIMATION OF PARTICLE-SIZE DISTRIBUTIONS
D. E. Amos and J. A. Davis Mar. 1982 43 p refs
(Contract DE-AC04-76DP-00789)
(DE82-014719; SAND-82-0511) Avail: NTIS HC A03/MF A01

A medium in which spherical particles of various sizes are sparsely distributed is sampled by removing thin slices which contain circular cross sections of these particles. The diameters of these circular cross sections have a frequency distribution g(x) which is related to the spherical frequency distribution f(x) by an Abel type integral equation. This integral equation is solved analytically, enabling one to deal explicitly with problems arising from sampling errors in g. An integral equation of the same type is derived for the cumulative of f in terms of the cumulative of g. Because a process resembling numerical differentiation of data is involved in estimating f from thin slices, the numerical problem may be ill-conditioned. Numerical processes used to estimate a smooth f from sampled data are explained. DOE

N83-20670# Central Inst. for Industrial Research, Oslo (Norway).
APPELL AND THE APPLE: NONLINEAR SPLINES IN SPACE
Even Mehlum 5 Nov. 1981 36 p refs
(PB83-100503; ISBN-82-7267-413-0) Avail: NTIS HC A03/MF A01 CSCL 12A

The report describes the mathematics and geometry of nonlinear, intrinsic splines in 3 space. The method is an extension of the KURGLA method for curve fitting used in the planar case. Author (GRA)

N83-20671# Central Inst. for Industrial Research, Oslo (Norway).
WAVE MODEL: NEAR FIELD DIFFRACTION OF TWO DIMENSIONAL WAVES
Gary Hutton 11 Aug. 1982 51 p
(PB83-100693; Rept-78-04-09-10; ISBN-82-7267-474-2) Avail: NTIS HC A04/MF A01 CSCL 12A

A numerical solution is presented for the solution of two dimensional wave fields in the near field. The boundary function for the field is assumed known, thus giving a unique and accurate solution to the wave equation. Author (GRA)

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N83-20672# San Diego State Univ., Calif. Dept. of Mathematical Sciences.
SIGNAL DETECTION FOR STOCHASTIC PROCESSES WITH STATIONARY INDEPENDENT SYMMETRIC INCREMENTS
C. B. Bell and R. Ahmad (Strathclyde Univ.) Jul. 1982 45 p refs
(Contract N00014-80-C-0208)
(AD-A121497; Rept-2-82) Avail: NTIS HC A03/MF A01 CSCL 12/1

For processes with stationary independent symmetric increments, several one-sample and 2-sample detection problems are treated. The statistical tools are based on minimal sufficient statistics and maximal statistical noise and employ rank-sum, sign, signed-rank and Kolmogorov-Smirnov statistics. Relevant point and interval estimation techniques are presented as are numerical examples illustrating the techniques. Author (GRA)

N83-20673# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
ON SOME INEQUALITIES AND MONOTONICITY PROPERTIES WITH SPECIAL REFERENCE TO SELECTION AND RANKING PROBLEMS
Shanti S. Gupta, Deng-Yuan Huang (National Taiwan Normal Univ.), and S. Panchapakesan (Univ. of Southern Illinois) Oct. 1982 36 p refs

(Contract N00014-75-C-0455)
(AD-A121451; TR-82-37) Avail: NTIS HC A03/MF A01 CSCL 12/1

Inequalities play a fundamental role in nearly all branches of mathematics -- especially so in probability and statistics. The impact of basic inequalities such as those that carry the names of Cauchy-Schwarz, Chebyshev, Cramer-Rao, and Bonferroni in statistics is well known. Inequalities have been profitably used to obtain bounds for probabilities that are more tedious to compute or analytically impossible to handle. Especially in reliability problems, the limited assumptions that could be made about the nature of the life distributions of the components of a system as well as the structure of the system itself render inequalities pervades through nearly all branches of mathematics, significant contributions have been made by a very large number of researchers whose efforts span well over a century. From time to time, books and monographs have been written which are completely devoted to inequalities. GRA

N83-20674# Texas Research Inst., Inc., Austin.
THE BAYESIAN INFERENCE METHOD AND ITS APPLICATION TO RELIABILITY PROBLEMS Final Report
R. Lowell Smith Washington NRL 15 Sep. 1982 37 p refs
(Contract N00173-81-W-T201)
(AD-A121880; NRL-MR-4903) Avail: NTIS HC A03/MF A01 CSCL 12/1

Statistical inference is the activity of characterizing the parameters of mathematical models by utilizing available sampling data. This report discusses as a specific motivation the modeling of reliability problems and deals only with inference while avoiding the larger area of decision theory. The classical and Bayesian approaches to evaluating the parameter of the familiar exponential reliability model are compared. Classically, model parameters are unknown constants which can be estimated. From the Bayesian viewpoint model parameters are treated as distributed random variables. As is also true of the classical maximum likelihood method, the determining or informational impact of the sampling data is represented completely by the likelihood function. Operationally, Bayesian inference involves applying Bayes theorem, a celecbrated consequence of conditional probability theory. The relevant probability background is developed and Bayes theorem derives. Bayesian inference has the very appealing capacity to incorporate previous information as well as current sampling inputs. Classical results are reproduced in the limiting forms of this involving noninformative prior distributions. Several application examples are discussed illustrating the use of both continuously and discretely distributed data and in one case emphasizing numerical methods. GRA

N83-20675# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
SOME LOCALLY OPTIMAL SUBSET SELECTION RULES FOR COMPARISON WITH A CONTROL
Deng-Yuan Huang, S. Panchapakesan, and Sheng-Tsaing Tseng Aug. 1982 18 p refs
(Contract N00014-75-C-0455)
(AD-A120938; TR-82-30) Avail: NTIS HC A02/MF A01 CSCL 12/1

The goal is to select from pi sub 1,..., pi sub k (experimental treatments) those populations, if any, that are better (suitably defined) than pi sub 0 which is the control population. A locally optimal rule is derived in the class of rules for which Pr(pi sub i is selected) = gamma sub i, 1 = 1,...,k, when theta sub 0 = theta sub 1 =...= theta sub k. The criterion used for local optimality amounts to maximizing the efficiency in a certain sense of the rule in picking out the superior populations for specific configurations of theta = (theta sub 0,...,theta sub k) in a neighborhood of an equiparameter configuration. The general result is then applied to the following special cases: (a) normal means comparison - common known variance, (b) normal means comparison - common unknown variance, (c) gamma scale parameters comparison - known (unequal) shape parameters, and (d) comparison of regression slopes. In all these cases, the rule is obtained based on samples of unequal sizes. GRA

N83-20676# California Univ., Riverside. Dept. of Mathematics.
BIMEASURES AND SAMPLING THEOREMS FOR WEAKLY HARMONIZABLE PROCESSES
Derek K. Chang and M. M. Rao 27 Sep. 1982 37 p refs Presented at the 30th SIAM Anniv. Meeting, Stanford, Calif., 19 Jul. 1982
(Contract N00014-79-C-0754)
(AD-A120937; TR-7) Avail: NTIS HC A03/MF A01 CSCL 12/1

The process be described in this report can be determined by sampling at fixed intervals nh, n = 0, + or - 1,... , h = pi/alpha > 0. A corresponding result is also obtained for a more general Cramer class. To carry out this analysis, it is necessary to use the properties of bimeasures. Some aspects of the bimeasure theory and its distinction from the Lebesgue theory are included. This is used essentially for the analysis of harmonizable processes, and has independent interest. GRA

N83-20677# California Univ., Berkeley. Operations Research Center.
EXPECTED INFORMATION FROM A LIFE TEST EXPERIMENT
Richard E. Barlow and Jaw Huan Hsiung May 1982 28 p refs
(Grant AF-AFOSR-0122-81; AF Proj. 2304)
(AD-A120878; ORC-82-5) Avail: NTIS HC A03/MF A01 CSCL 09/4

Expected information gain as a result of life testing n units for time t is calculated for the time transformed exponential model and a utility function based on entropy. We show that the expected information gain is concave increasing in n and a transform of the test time t. A computer program for calculating expected entropy for the Weibull distribution model is given. This may provide practical guidance in designing life test experiments. GRA

N83-20678# San Diego State Univ., Calif. Dept. of Mathematical Sciences.
SIGNAL DETECTION FOR PARETO RENEWAL PROCESSES
C. B. Bell, R. Ahmad (Strathclyde Univ.), C. J. Park, and R. Lui Oct. 1982 70 p refs
(Contract N00014-80-C-0208)
(AD-A120972; Rept-8-82) Avail: NTIS HC A04/MF A01 CSCL 12/1

Employing minimal sufficient statistics maximal statistical noise, several Kolmogorov-type statistics; and conditional distributions, optimal detection procedures are constructed for various one-and-two-sample problems involving Pareto Renewal processes. Cases with and without nuisance parameters are treated. Optimal parametric and distribution-free procedures are developed. GRA

N83-20679# Wisconsin Univ., Madison. Mathematics Research Center.
ON MINIMUM INFORMATION PRIOR DISTRIBUTIONS
Hirotugu Akaike (Inst. of Statistical Mathematics) Aug. 1982 19 p refs
(Contract DAAG29-80-C-0041)
(AD-A120969; MRC-TSR-2410) Avail: NTIS HC A02/MF A01 CSCL 12/1

An explicit formulation of the concept of non-informative prior distribution over a finite number of possibilities is given. Numerical examples show that the formulation leads to non-trivial results. An information inequality is established to assure the validity of numerical results. The relation of the present work to other works on the same subject is briefly discussed. GRA

N83-20680# Wisconsin Univ., Madison. Mathematics Research Center.
DROPPING OBSERVATIONS WITHOUT AFFECTING POSTERIOR AND PREDICTIVE DISTRIBUTIONS
Norman R. Draper and Irwin Guttman (Toronto Univ.) Aug. 1982 16 p refs Sponsored in part by the Canadian NSFRC and the Canadian Council in Humanities and Social Sciences
(Contracts DAAG29-80-C-0041; DAAG29-80-C-0113)
(AD-A120968; MRC-TSR-2409) Avail: NTIS HC A02/MF A01 CSCL 12/1

Suppose in a distribution problem, the sample information W

is split into two pieces W sub 1 and W sub 2 prime and the parameters involved are split into two sets phi containing the parameters of interest, and theta containing nuisance parameters. It is shown that, under certain conditions, the posterior distribution of phi does not depend on the data W sub 2 prime which can thus be ignored. This also has consequences for the predictive distribution of future (or missing) observations. In fact, under similar conditions, the predictive distributions using W or just W sub 1 are identical. GRA

N83-20681# Wisconsin Univ., Madison. Mathematics Research Center.
AN APOLOGY FOR ECUMENISM IN STATISTICS
G. E. P. Box Jul. 1982 38 p refs
(Contract DAAG29-80-C-0041)
(AD-A120967; MRC-TSR-2408) Avail: NTIS HC A03/MF A01 CSCL 12/1

Reasons are advanced for the belief that scientific method employs and requires not one, but two kinds of inference - criticism and estimation; once this is understood the statistical advances made in recent years in Bayesian methods, data analysis, robust and shrinkage estimators can be seen as a cohesive whole. GRA

N83-20682# Wisconsin Univ., Madison. Mathematics Research Center.
PREDICTION AND ENTROPY Technical Summary Report
Hirotugu Akaike Jun. 1982 37 p refs
(Contract DAAG29-80-C-0041)
(AD-A120956; MRC-TSR-2397) Avail: NTIS HC A03/MF A01 CSCL 20/13

The emergence of the magic number 2 in recent statistical literature is explained by adopting the predictive point of view of statistics with entropy as the basic criterion of the goodness of a fitted model. The historical development of the concept of entropy is reviewed and its relation to statistics is explained by examples. The importance of the entropy maximization principle as the basis of the unification of conventional and Bayesian statistics is discussed. Author (GRA)

N83-20683# Wisconsin Univ., Madison. Mathematics Research Center.
ON THE FALLACY OF THE LIKELIHOOD PRINCIPLE Technical Summary Report
Hirotugu Akaike Jun. 1982 14 p refs
(Contract DAAG29-80-C-0041)
(AD-A120954; MRC-TSR-2395) Avail: NTIS HC A02/MF A01 CSCL 12/1

By using the direct and inverse binomial experiments it is shown that there is a situation where Birnbaum's basic axiom of mathematical equivalence and the likelihood principle is a tautology. This observation disqualifies the Birnbaum's proof of the likelihood principle based on the axioms of mathematical equivalence and conditionality. The implication of this disproof of Birnbaum's argument for Bayesian statistics is briefly discussed. GRA

N83-20684# National Taiwan Normal Univ., Taipei. Dept. of Statistics.
GAMMA-OPTIMAL DECISION PROCEDURES FOR SELECTING THE BEST POPULATION IN RANDOMIZED COMPLETE BLOCK DESIGN
Deng-Yuan Huang and Sheng-Tsaing Tseng Oct. 1982 18 p refs Prepared in cooperation with Purdue Univ., Lafayette, Ind.
(Contract N00014-75-C-0455)
(AD-A120946; TR-82-36) Avail: NTIS HC A02/MF A01 CSCL 12/1

In randomized complete block design, we face the problem of selecting the best population. If some partial information about the unknown parameters is available, then we wish to determine the optimal decision rule to select the best population. In this paper, in the class of natural selection rules, we employ the gamma-optimal criterion to determine optimal decision rules that will minimize the maximum expected risk over the class of some partial information. Furthermore, the traditional hypothesis testing is briefly discussed from the view point of ranking and selection. GRA

N83-20685# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Statistics.
MULTIVARIATE DIRECTED GRAPHS IN STATISTICS
Stephen E. Fienberg Oct. 1982 11 p refs
(Contract N00014-80-C-0637)
(AD-A121922; TR-258) Avail: NTIS HC A02/MF A01 CSCL 12/1

Directed graphs are natural mathematical representations of biological and social networks, and are used in other areas of application such as statistical geography, transportation, and epidemiology. This article reviews some of the recent statistical literature on the analysis of directed graphs, especially in the multivariate case. Author (GRA)

N83-20686# Stanford Univ., Calif. Dept. of Statistics.
EDF STATISTICS FOR TESTING FOR THE GAMMA DISTRIBUTION, WITH APPLICATIONS
A. N. Pettitt and M. A. Stephens 13 Aug. 1982 16 p refs
(Contract N00014-76-C-0475)
(AD-A121417; SU-TR-323) Avail: NTIS HC A02/MF A01 CSCL 12/1

Several years ago the authors found percentage points for EDF statistics for the Gamma distribution with known shape parameter but unknown scale parameter (the origin of the distribution was assumed to be zero). The gamma or equivalently the chi-squared distribution often occurs as a possible model for observations or as the distribution of some derived statistics. For example, in lifetime or survival studies the gamma distribution can be proposed as the distribution of lifetime or some function of lifetime. The chi-squared distribution occurs as the distribution for sums of squares in ANOVA tables and also in time series analysis, in the study of periodograms, and in multivariate analysis, as the distribution of squared radii. Despite the many uses of the gamma distribution, the application of the tables might seem to be limited, because the shape parameter must be known. In the earlier reports, are an illustration of the use of EDF statistics to test that the sample variances of cells of an ANOVA table, with the same number of observations in each cell, all came from the same distribution. Since then, other applications have come to light and these will be presented in this report; also the test procedures and the tables will be reproduced to make the report complete in itself. GRA

N83-20687# Stanford Univ., Calif. Dept. of Statistics.
MAXIMUM LIKELIHOOD ESTIMATORS AND LIKELIHOOD RATIO CRITERIA FOR MULTIVARIATE ELLIPTICALLY CONTOURED DISTRIBUTIONS
T. W. Anderson and Kai-Tai Fang (Academia Sinica, Beijing, China) Sep. 1982 33 p refs
(Contract DAAG29-82-K-0156)
(AD-A120909; SU-TR-1; ARO-19065.1-MA) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this paper we generalize the theory of maximum likelihood estimation and likelihood ratio criteria from normal distributions to multivariate elliptically contoured distributions for which the vector observations are not necessarily either normal or independent. We find that many usual likelihood ratio criteria and their null distributions are the same in the class of multivariate elliptically contoured distributions. GRA

N83-20688*# George Washington Univ., Washington, D.C. Inst. for Management Science and Engineering.
THE RANDOMIZATION TECHNIQUE AS A MODELING TOOL AND SOLUTION PROCEDURE FOR TRANSIENT MARKOV PROCESSES
Donald Gross and Douglas R. Miller 10 Aug. 1982 54 p refs
(Grant NAG1-179; Contract N00014-75-C-0729)
(NASA-CR-170017; NAS 1.26:170017; AD-A121730; SERIAL-T-467) Avail: NTIS HC A04/MF A01 CSCL 12A

The randomization procedure for computing transient solutions

to Markov processes (discrete state space, continuous time) is presented. This procedure computes transient state probabilities. It is based on a construction relating a continuous time Markov process to a discrete time Markov chain. Modifications and extensions of the randomization method allow for computation of distributions of first passage and sojourn times in Markov processes, and also computation of expected cumulative occupancy times and expected number of events occurring during a time interval. Several implementations of the randomization procedure are discussed. The implementation for a general class of Markov processes which can be described in terms of state space (S), event set (E), rate vectors (R), and target vectors (T) --abbreviated as SERT-- is presented. This general approach can handle systems whose state spaces are quite large and have sparse generators. Author (GRA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N83-20689# Purdue Univ., Lafayette, Ind. Graduate School of Management.
INTEGRATION OF OPERATIONS RESEARCH AND INFORMATION SYSTEMS Final Report, 1 Aug. 1979 - 31 Jul. 1982
Andrew B. Whinston Oct. 1982 13 p refs
(Contract DAAG29-79-C-0154)
(AD-A120930; ARO-16231.11-EL) Avail: NTIS HC A02/MF A01 CSCL 12/2

This report consists of abstracts of a number of papers in the areas of data base design theory, office automation theory, decision support system theory, and problem solving. GRA

N83-20690# Army War Coll., Carlisle Barracks, Pa. Strategic Studies Inst.
THE RELATIONSHIP OF FORECASTING TO LONG-RANGE PLANNING
Charles W. Taylor 15 Nov. 1982 33 p Presented at the DARCOM Strategic Long-Range Planning Workshop, Chantilly, Va., 24-26 Aug. 1982
(AD-A121984; ACN-82020) Avail: NTIS HC A03/MF A01 CSCL 05/1

Attention is directed to the coherent and essential linkage between long-range forecasting and long-range planning with their focus on the management of the future. It also clearly distinguishes between these two activities. Finally, the need for an Army capability to provide comprehensive, alternative long-range forecasts as foundations for Army long-range planning is emphasized. Author

N83-20691# Woodard-Clyde Consultants, San Francisco, Calif.
DECISION FRAMEWORK FOR TECHNOLOGY CHOICE. VOLUME 2: DECISION ANALYSIS USERS MANUAL
A. Sicherman and R. L. Keeney Mar. 1982 84 p refs 2 Vol. (EPRI Proj. RP-1433-1)
(DE82-903150; EPRI-EA-2153-Vol-2) Avail: NTIS HC A05/MF A01

A computer program was developed to aid decision makers in choosing among alternatives. It facilitiates the implementation of the decision analysis approach to multiobjective decision-making problems. The program's main functions are to store the information and perform all the necessary computations required by the approach. The program is designed so that only a few basic commands need to be understood in order to use it effectively. The style of input can be both batch and interactively oriented. Detailed specification of preferences and alternatives is usually done in batch mode while sensitivity analysis can be performed interactively. The output consists of ranking, preference and alternative information displays. The code allows for an interface to user supplied models when that is desirable. It is designed to run on most computer systems without or with very minor system-specific modifications. DOE

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

No abstracts in this category.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N83-20692# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Human Factors.
THREE-DIMENSIONAL DISPLAYS: PERCEPTUAL RESEARCH AND APPLICATIONS TO MILITARY SYSTEMS Final Report, 1 Aug. 1981 - 30 Sep. 1982
David J. Getty, ed. (Bolt, Beranek and Newman, Inc., Cambridge, Mass.) 1982 191 p refs Symp. held in Washington, D.C., 29 Jan. 1982
(Contract N00014-81-C-0017; NR Proj. 196-167; RR0420901)
(AD-A122577) Avail: NTIS HC A09/MF A01 CSCL 20/6

The edited proceedings of a symposium on the design and applications of three-dimensional displays are presented. The symposium was held at the National Academy of Sciences Building in Washington, D.C. on January 29, 1982. The symposium contained three parts. The first consisted of a series of five papers that discussed basic perceptual research on, and relating to, the design and use of three-dimensional displays. The second part of the symposium was a panel discussion on the topic: Critical Research Issues in 3-D displays. The third and final part of the symposium was a discussion by a second panel of the topic: The applicability of 3-D Display Research to Military Operational Needs. For individual titles, see N83-20693 through N83-20702.

N83-20693# Vanderbilt Univ., Nashville, Tenn. Dept. of Psychology.
THE EFFECT OF DEPTH POSITION ON STIMULUS INTERACTION **c74**
Robert Fox *In* NAS-NRC Three-Dimensional Displays 1982 p 7-28 refs (For primary document see N83-20692 10-70)
Avail: NTIS HC A09/MF A01 CSCL 20/6

Some of the conclusions that have emerged from a program of research concerned broadly with the processing of visual information from three-dimensional displays are summarized. One specific interest concerns the effect of depth position on the interaction among stimuli. What is meant by those phrases, depth position, and interaction among stimuli are explained. L.F.M.

N83-20694# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
DISPLAY-CONTROL COMPATIBILITY IN 3-D DISPLAYS **c54**
A. W. F. Huggins and D. J. Getty *In* NAS-NRC Three-Dimensional Displays 1982 p 29-54 refs (For primary document see N83-20692 10-70)
Avail: NTIS HC A09/MF A01 CSCL 05/8

Some problems of display-control compatibility that confront the human operator of a true volumetric 3-D are explored. The speed and accuracy with which an operator can make decisions about directions in displayed object-space (up, down, left, right), when an object is presented in unpredictable orientations is measured. Operators employ three strategies in this task. In order of decreasing speed and accuracy, they are: (1) a spatial strategy, which can be applied only when the display object and the control object are in the same orientation; (2) a relational strategy, in which the choice is made on the basis of the spatial relationship between the cued direction and the orientation cue provided in the icon; and (3) a rotational strategy, in which the operator mentally rotates his body position so as to make the orientation of the displayed object equivalent to that of the control object. In the third strategy, response times increase progressively with the

amount of rotation required. In the final experiments, it is shown that use of the third strategy can be avoided by appropriate coding of the display icon. Author

N83-20695# SRI International Corp., Menlo Park, Calif.
STEREOPSIS HAS THE EDGE IN 3-D DISPLAYS **c74**
Thomas P. Piantanida *In* NAS-NRC Three-Dimensional Displays 1982 p 55-84 refs (For primary document see N83-20692 10-70)
Avail: NTIS HC A09/MF A01 CSCL 20/6

The results of studies conducted at SRI International to explore differences in image requirements for depth and form perception with 3-D displays are presented. Monocular and binocular stabilization of retinal images was used to separate form and depth perception and to eliminate the retinal disparity input to stereopsis. Results suggest that depth perception is dependent upon illumination edges in the retinal image that may be invisible to form perception, and that the perception of motion-in-depth may be inhibited by form perception, and may be influenced by subjective factors such as ocular dominance and learning. Author

N83-20696# Michigan Univ., Ann Arbor. Perception Lab.
DOT AND LINE DETECTION IN STEREOSCOPIC SPACE **c74**
William R. Uttal, Mark Azzato, and John Brogan *In* NAS-NRC Three-Dimensional Displays 1982 p 85-126 refs (For primary document see N83-20692 10-70)
Avail: NTIS HC A09/MF A01 CSCL 20/6

The results of a series of five experiments in which it was sought to determine the effect of the spatial and temporal attributes of a dotted stimulus form on its detectability when masked by random dotted visual noise are presented. The stimulus consisted either of a single dot that was repetitively flashed or of a straight line of seven dots. The number of noise dots, the interval between stimulus dots, dot poisition, trajectory direction, and regularity of the spatial and temporal intervals were examined to determine what, if any, influence these stimulus properties exerted on stimulus detectability. Among the more surprising results was the discovery of a remarkable insensitivity to the temporal irregularity of either a flashing single dot or a sequentially plotted line of dots. In addition, an equivalent insensitivity to spatial position irregularity in a line of dots was also discovered for the conditions used in this experiment. The significance of these findings to our understanding of visual image processing is discussed as well as possible applications of the methods and findings emerging from these experiments. Some suggestions for future research are also presented. Author

N83-20697# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
CRITICAL RESEARCH ISSUES ON COCKPIT APPLICATIONS OF 3-D DISPLAYS **c06**
Kenneth R. Boff *In* NAS-NRC Three-Dimensional Displays 1982 p 129-138 refs (For primary document see N83-20692 10-70)
Avail: NTIS HC A09/MF A01 CSCL 01/4

The Human Engineering Division of the Air Force Aerospace Medical Research Laboratory is engaged in exploratory research to support development of a pilot-centered cockpit design technology. This involves the development of sound theoretical and empirical bases for matching the perceptual and psychomotor characteristics of the aircrew with the design of controls, displays and approaches for portrayal of information within the cockpit. Applications of the three dimensional (3-D) presentation of information which exploit the human's highly refined and well practiced sense of depth are discussed for their potential in facilitating the transfer of information in future aircrew cockpits. L.F.M.

N83-20698# Louisville Univ., Ky. Performance Research Lab.
A STEREO-RANGEFINDER EXPERIENCE **c74**
George S. Harker *In* NAS-NRC Three-Dimensional Displays 1982 p 139-144 refs (For primary document see N83-20692 10-70)
Avail: NTIS HC A09/MF A01 CSCL 20/6

Past experiences in attempting to incorporate stereo range finders in Army tank operations are discussed. The problems making the range finder impractical are presented, and it is suggested there is a lack of basic understanding of the stereo processes. L.F.M.

N83-20699# Perceptronics, Inc., Woodland Hills, Calif.
ISSUES IN THE EVALUATION OF 3-D DISPLAY APPLICATIONS **c74**
John O. Merrit *In* NAS-NRC Three-Dimensional Displays 1982 p 145-149 refs (For primary document see N83-20692 10-70)
Avail: NTIS HC A09/MF A01 CSCL 20/6

The potential benefits of 3-D or stereoscopic visual displays have not been fully appreciated in a number of important application areas. This may be due to problems in the way stereo systems have been evaluated with respect to non-stereo displays. Only a few experimental evaluations have shown performance advantages for stereoscopic displays, whereas most comparisons have shown little or no stereo benefit. In some cases, performance with stereo was worse than with a non-stereo system. Proper experimental evaluation of 3-D visual display systems requires attention to the following factors: Equal display quality in the stereo and non-stereo systems; performance measurement with tasks that realistically represent the perceptual complexity of the operational environment, and the learning, time constraints, and error penalties present in the real world; appreciation of the several side benefits obtained with stereoscopic visual displays, such as improved image interpretability and wider field of view, as well as better system reliability; reconsidering the practicality of stereoscopic techniques in applications where stereo has previously been through to be of little value, as in flight simulator displays. L.F.M.

N83-20700# Naval Ocean Systems Center, Kailua, Hawaii.
VISUAL PERCEPTION RESEARCH AT NAVAL OCEAN SYSTEMS CENTER **c74**
Ross L. Pepper *In* NAS-NRC Three-Dimensional Displays 1982 p 151-154 (For primary document see N83-20692 10-70)
Avail: NTIS HC A09/MF A01 CSCL 20/6

Recent research in the use of 3-D displays in underwater vehicles is discussed. Emphasis is given to stereotelevision. L.F.M.

N83-20701# Naval Air Development Center, Warminster, Pa.
THE APPLICABILITY OF 3D DISPLAY RESEARCH TO MILITARY OPERATIONAL NEEDS **c06**
James H. Brindle *In* NAS-NRC Three-Dimensional Displays 1982 p 157-170 (For primary document see N83-20692 10-70)
Avail: NTIS HC A09/MF A01 CSCL 01/4

Research and development associated with stereo displays in military organizations over the past 15 years are discussed. Applications of these 3-D displays were: remote manipulation, bomb disposal, vehicle control pilotage, reconnaissance target acquisition, air to air refueling, fire control weapon delivery, and computer generated information imagery. L.F.M.

N83-20702# Federal Aviation Administration, Washington, D.C. Airborne Systems Branch.
APPLICABILITY OF 3D DISPLAY RESEARCH TO OPERATIONAL NEEDS **c06**
Roger P. Neeland *In* NAS-NRC Three-Dimensional Displays 1982 p 171-176 (For primary document see N83-20692 10-70)
Avail: NTIS HC A09/MF A01 CSCL 01/4

Potential future aircraft applications of 3-D displays are discussed. Among those emphasized were: approach guidance, vertical guidance, collision avoidance, weather display, and simulation technology. L.F.M.

N83-20703# Army Electronics Research and Development Command, Fort Monmouth, N. J. Electronics Technology/Devices Lab.
DESIGN CONSIDERATIONS IN THE EMPLOYMENT OF RARE EARTH-COBALT PERMANENT MAGNETS AS FLUX SOURCES
Herbert A. Leupold Nov. 1982 19 p refs
(DA Proj. 1L1-61101-A-91A)
(AD-A122138; DELET-TR-82-9) Avail: NTIS HC A02/MF A01 CSCL 20/3

The design advantages resulting from the linear demagnetization curves of rare-earth permanent magnets are discussed. The magnetic analogue to Ohm's law is derived and its affiliation illustrated by an example. Other aspects of design, such as the replacement of magnetic circuits with equivalent pole densities and the significance of the energy product, are also discussed.
Author (GRA)

N83-19778*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Operations Sustaining Engineering Section.
A TWO-YEAR HISTORY OF ATOMIC FREQUENCY STANDARDS SYNTONIZATION IN THE DEEP SPACE NETWORK
S. C. Ward *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 118-127 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 14B

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N83-20704 Royal Aircraft Establishment, Farnborough (England). Human Engineering Div.
MEASUREMENTS OF THE ATTENUATION OF AN ARMY HEADSET
M. K. Cogger and S. A. Wood Jan. 1982 13 p
(BR84535; RAE-TM-FS-449) Copyright. Avail: Issuing Acitivity

Acoustic attenuation measurements have been made on a headset currently in use in British armoured military vehicles, which is reported to demonstrate good low-frequency noise attenuation. The results of the tests are reported and discussed with reference to the use of this form of earmuff assembly in a helicopter crew helmet, since helicopter cabin noise is predominantly low-frequency in nature.
Author

N83-20705*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AEROACOUSTIC RESEARCH FACILITIES AT NASA LANGLEY RESEARCH CENTER: DESCRIPTION AND OPERATIONAL CHARACTERISTICS
Harvey H. Hubbard and James C. Manning Mar. 1983 25 p refs
(NASA-TM-84585; L-15563; NAS 1.15:84585) Avail: NTIS HC A02/MF A01 CSCL 20A

A number of facilities were developed which provide unique test capabilities for aeroacoustic research. Information regarding physical layouts, dimensions, construction features, and operating capabilities of these facilities is compiled. Possible research applications include the behavior of such noise sources as jets, rotors, and propellers in simulated forward motion; studies of noise due to the interactions of aerodynamic flows with solid surfaces and bodies; sound propagation in ducts with airflow; and the evaluation of acoustical materials.
Author

N83-20706*# Houston Univ., Tex. Aerodynamics and Turbulence Lab.
THE WHISTLER NOZZLE PHENOMENON
A. K. M. F. Hussain and M. A. Z. Hasan Oct. 1982 36 p refs (Grant NAG3-198)
(NASA-CR-170015; NAS 1.26:170015; FM-15) Avail: NTIS HC A03/MF A01 CSCL 20A

The whistler nozzle is a simple device which can induce jet self-excitations of controllable amplitudes and frequencies and appears highly promising for many applications involving turbulent transport, combustion and aerodynamic noise. The characteristics of this curious phenomenon are documented for different values of the controlling parameters and attempts to explain the phenomenon. It is shown that the whistler excitation results from the coupling of two independent resonance mechanisms: shear-layer tone resulting from the impingement of the pipe-exit shear layer on the collar lip, and organ-pipe resonance of the pipe-nozzle. The crucial role of the shear-layer tone in driving the organ-pipe resonance is proven by reproducing the event in pipe-ring and pipe-hole configurations in the absence of the collar. It is also shown that this phenomenon is the strongest when the self-excitation frequency matches the preferred mode of the jet.
Author

N83-20707 Royal Aircraft Establishment, Farnborough (England).
THE INFLUENCE OF HELICOPTER OPERATING CONDITIONS ON ROTOR NOISE CHARACTERISTICS AND MEASUREMENT REPEATABILITY
M. R. P.. Law and J. Williams Apr. 1982 44 p refs
(AD-A121426; RAE-TR-82030; Aero-3525; BR84664) Copyright. Avail: Issuing Activity

Following on exploratory developments in flight testing techniques and data analysis procedures for helicopter external noise, extensive measurements of noise characteristics and associated flight path data were made on several helicopters in various operational modes, with repeated flight trajectories over longitudinal and lateral arrays of ground based microphones under quiet airfield conditions. This analysis presents some experimental results from Lynx aircraft with standard rotor configurations, being concerned primarily with the influence of different operating procedures on both main rotor and tail rotor noise characteristics and on measurement repeatability during level flight, oblique landing approach, and oblique take off. Some tail rotor near field noise signatures were also derived for correlation purposes, using a microphone mounted with a forward facing nose cone just outside the fuselage skin on the tail boom.
S.L.

N83-20708*# Lockheed-Georgia Co., Marietta.
REFINEMENT AND APPLICATION OF ACOUSTIC IMPULSE TECHNIQUE TO STUDY NOZZLE TRANSMISSION CHARACTERISTICS Final Report
M. Salikuddin, W. H. Brown, R. Ramakrishnan, and H. K. Tanna Washington NASA Feb. 1983 406 p refs
(Contract NAS3-20797)
(NASA-CR-3656; NAS 1.26:3656; LG82-ER-0115) Avail: NTIS HC A18/MF A01 CSCL 20A

An improved acoustic impulse technique was developed and was used to study the transmission characteristics of duct/nozzle systems. To accomplish the above objective, various problems associated with the existing spark-discharge impulse technique were first studied. These included (1) the nonlinear behavior of high intensity pulses, (2) the contamination of the signal with flow noise, (3) low signal-to-noise ratio at high exhaust velocities, and (4) the inability to control or shape the signal generated by the source, specially when multiple spark points were used as the source. The first step to resolve these problems was the replacement of the spark-discharge source with electroacoustic driver(s). These included (1) synthesizing on acoustic impulse with acoustic driver(s) to control and shape the output signal, (2) time domain signal averaging to remove flow noise from the contaminated signal, (3) signal editing to remove unwanted portions of the time history, (4) spectral averaging, and (5) numerical smoothing. The acoustic power measurement technique was improved by taking multiple induct measurements and by a modal decomposition process to account for the contribution of higher order modes in the power computation. The improved acoustic impulse technique was then validated by comparing the results derived by an impedance tube method. The mechanism of acoustic power loss, that occurs when sound is transmitted through nozzle terminations, was investigated. Finally, the refined impulse technique was applied to obtain more accurate results for the acoustic transmission characteristics of a conical nozzle and a multi-lobe multi-tube supressor nozzle.Author

N83-20709*# General Electric Co., Cincinnati, Ohio. Technical Programs and Program Technology Dept.
FORWARD VELOCITY EFFECTS ON FAN NOISE AND THE INFLUENCE OF INLET AEROACOUSTIC DESIGN AS MEASURED IN THE NASA AMES 40 X 80 FOOT WIND TUNNEL Technical Report, 8 Nov. 1979 - 31 Jan. 1981
R. G. Holm, L. E. Langenbrunner, and E. O. McCann Jul. 1981

188 p refs
(Contract NAS2-8675)
(NASA-CR-166461; NAS 1.26:166461; R81AEG545) Avail: NTIS HC A09/MF A01 CSCL 20A

The inlet radiated noise of a turbofan engine was studied. The principal research objectives were to characterize or suppress such noise with particular regard to its tonal characteristics. The major portion of this research was conducted by using ground-based static testing without simulation of aircraft forward speed or aircraft installation-related aeroacoustic effects. Author

N83-20710# Naval Ocean Systems Center, San Diego, Calif.
GROUND RUNUP NOISE SUPPRESSION PROGRAM. PART 3: DRY SUPPRESSOR TECHNOLOGY BASE Final Report, Jul. 1974 - Oct. 1980
R. Glass and M. Lepor 20 Jun. 1982 205 p refs
(Proj. Y0817SL)
(AD-A122025; NOSC/TR-674-Pt-3) Avail: NTIS HC A10/MF A01 CSCL 20/1

The Ground Runup Noise Suppression Final Report consists of three documents. The first document, Part 1, is an executive summary which provides a brief, technical description and overview of the program conducted at the Naval Ocean Systems Center (NOSC). The second document, Part 2, provides a documented history of NOSC's participation in the Dry Jet Noise Suppression Program. This document, Part 3, is a technical summary of the information and data developed during the program. This report integrates predictive techniques, scale-model test results, and full-scale test results for the new air-cooled noise suppressor technology. All program data are summarized to assist the architect/engineer in the design of air-cooled noise suppressors. Included are aerothermal, aeroacoustic, and pressure data in addition to acoustic material life cycle information. Cost/benefit techniques are included to aid in the selection of air-cooled or water-cooled facilities based on operational requirements.
Author (GRA)

N83-20711# Pennsylvania State Univ., University Park. Applied Research Lab.
ACOUSTIC PROPAGATION AND BARRIER DIFFRACTION OVER AN IMPEDANCE PLANE Ph.D. Thesis
Matthew A. Nobile 13 Oct. 1982 217 p refs
(Contract N00024-79-C-6043)
(AD-A122023; ARL/PSU-TM-82-210) Avail: NTIS HC A10/MF A01 CSCL 12/1

The primary objective of this study was to derive a more exact solution to the problem of acoustic point-source propagation over a locally-reacting, impedance or ground plane. This objective was met with the derivation of an asymptotic series solution. One of the most important features of this solution is that higher-order terms can be calculated from preceding terms in the series by the use of recursion formulae, also derived here. Comparing data predicted from this solution with that from a numerical integration of the exact expression showed the asymptotic series to be extremely accurate, even for very low values of the parameter kR. As expected, the plane wave solution often showed major deviations from the exact integral solution. A secondary goal was to incorporate the new propagation solution into a barrier model so that ground reflections in addition to edge diffraction could be accounted for. Only the first term in the asymptotic ground propagation solution was used for this purpose, as it was shown to be sufficiently accurate for many practical cases. Thus, an Edge-Plus-Images barrier diffraction model was developed in the second phase of this study. The results of preliminary sensitivity tests reported here are very encouraging, and indicate that the barrier model should afford a higher degree of accuracy than available with similar models employing the plane wave reflection coefficient. GRA

N83-20712# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
MONOLITHIC ZnO SAW STRUCTURES Interim Scientific Report, 1 May 1981 - 30 Apr. 1982
Robert L. Gunshor and Robert F. Perret 1 Jun. 1982 35 p refs
(Contract AF-AFOSR-0214-81; AF Proj. 2306)
(AD-A121689; AFOSR-82-1005TR) Avail: NTIS HC A03/MF A01 CSCL 20/1

ZnO-on-silicon surface acoustic wave devices have been fabricated and tested. The first low temperature deposited AlN-on-silicon devices were reported. The performance of a high frequency transducer is discussed, and the operation of a new surface acoustic wave storage correlator, the induced junction correlator, is described. GRA

N83-20713# CACI, Inc. - Federal, Arlington, Va.
INM, INTEGRATED NOISE MODEL. VERSION 3: INSTALLATION INSTRUCTIONS
Mary Catherine Flythe Oct. 1982 60 p refs Supersedes FAA-EE-80-50
(Contract DOT-FA79WA-4295)
(AD-A122199; FAA-EE-81-19; FAA-EE-80-50) Avail: NTIS HC A04/MF A01 CSCL 09/2

This document provides the necessary instructions for programming personnel to install Integrated Noise Model (INM) Version 3 on the CDC 6000, Cyber 170 or IBM S/360-370 computers. INM Version 3 is the state-of-the-art computer tool for determining the total impact of aircraft noise at and around airports. This manual describes the model history, the model components, the hardware and software requirements, the characteristics of the model release tapes, the installation procedures and the execution procedures. INM Version 3 supersedes Version 2 which was released in September 1979. This document replaces 'INM, Integrated Noise Model, Version 2, Installation Instructions'. GRA

N83-20714# CACI, Inc. - Federal, Arlington, Va.
INM, INTEGRATED NOISE MODEL. VERSION 3: USERS GUIDE
Mary Catherine Flythe Oct. 1982 195 p refs Supersedes FAA/EE-79-09
(Contract DOT-FA79WA-4295)
(AD-A122227; FAA-EE-81-17; FAA-EE-79-09) Avail: NTIS HC A09/MF A01 CSCL 01/2

This document contains the instructions to execute the Integrated Noise Model (INM), Version 3. INM Version 3 is the state-of-the-art computer tool for determining the total impact of aircraft noise at and around airports. This manual contains a general description of elements of an airport study case and specific instructions for preparing the input for a case. INM Version 3 supersedes Version 2 which was released in September 1979. This document replaces INM, Integrated Noise Model, Version 2, User's Guide. GRA

N83-20715# Aerospace Research Applications Center, Indianapolis, Ind.
EVALUATION OF PULSE-ECHO ULTRA-SOUND FOR STEAM-GENERATOR TUBE-TO-SUPPORT PLATE GAP MEASUREMENT Final Report
E. S. Furgason and V. L. Newhouse Mar. 1982 118 p refs Sponsored by EPRI
(EPRI Proj. S142-1)
(DE82-903297; EPRI-NP-2285) Avail: NTIS HC A06/MF A01

A technique is described for measuring the crevice gap between the outer surfaces of coolant tubes in steam generators and the magnetic corrosion layer which forms on the support plates. An ultrasound pulse echo systems is used in which the pulses are transmitted radially outwards from within the tube. This type of measurement was hitherto impossible because of reverberation in the tube wall as well as excessive sound scattering by the nonspecular magnetite surface. The reverberation problem is solved by waiting long enough after each emitted pulse for energy to couple out of the reverberation mode into a mode which provides the crevice gap size. The nonspecular scattering effects are overcome by focusing the interrogating sound beam with an ellipsoidal mirror so that all rays between the focus and the transducer have the same path length. Tests show that signals from corroded samples can be acquired with good signal to noise

ratio, and that simulations of corroded support plates can be accurately profiled. DOE

N83-20716# Oulu Univ. (Finland). Dept. of Electrical Engineering.
A NEW HOLOGRAPHIC METHOD FOR IMPROVING LATERAL RESOLUTION IN ULTRASONIC B-SCAN IMAGING
Esko Alasaarela 1981 24 p refs
(PB83-102061; Rept-S-68/1981; ISBN-951-42-1031-X; ISSN-0356-0899) Avail: NTIS HC A02/MF A01 CSCL 20A

A ultrasonic holographic imaging method, UHB imaging (ultrasonic holographic B-scan imaging) is described. The starting point was an attempt to improve the lateral resolution of conventional ultrasonic B-scan imaging by using the holographic principle. The object is illuminated by transmitting wide angle ultrasonic bursts from each point of the hologram line. The echoes reflected from each distance of the transducer are measured at each point using a time gating principle. Both amplitude and phase are measured and stored in a computer memory. The image is then reconstructed from these data in the computer by a method based on the backward propagation of wavefronts. Mathematically, this process is based on a Fourier transform, an inverse Fourier transform, and a spectrum shift theorem. GRA

N83-20717# Oulu Univ. (Finland). Dept. of Electrical Engineering.
COMPUTER SIMULATIONS AND EXPERIMENTS ON ONE-DIMENSIONAL ULTRASONIC HOLOGRAPHY
Kalervo Tervola and Esko Alasaarela 1981 23 p refs
(PB83-101964; S-74/1981; ISBN-951-42-1155-3; ISSN-0356-0899) Avail: NTIS HC A02/MF A01 CSCL 20A

Theoretical studies on the lateral resolution of ultrasonic holography is pursued. The theory is verified by simulations and experiments. The holograms are calculated using trigonometrical methods. The backward propagation method is used when reconstructing the images. Experimental one-dimensional holograms are measured by a mechanically scanned transducer and the images are reconstructed by the method used by the simulation program. GRA

N83-20835*# Textron Bell Helicopter, Fort Worth, Tex. Acoustics Group.
HELICOPTER NOISE
Charles M. Cox *In* American Planning Association Proc. of the Monterey Conf. on Planning for Rotorcraft and Commuter Air Transportation Feb. 1983 p 84-87 ref (For primary document see N83-20830 10-85)
Avail: NTIS HC A09/MF A01 CSCL 20A

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N83-20718*# Boston Coll., Chestnut Hill, Mass.
DISSOCIATIVE RECOMBINATION OF O2(+), NO(+) AND N2(+) Semiannual Progress Report, 1 Aug. 1982 - 31 Jan. 1983
Steven L. Guberman 1983 10 p refs
(Grant NAG2-89)
(NASA-CR-169987; NAS 1.26:169987; SAPR-4) Avail: NTIS HC A02/MF A01 CSCL 20H

A new L(2) approach for the calculation of the threshold molecular capture width needed for the determination of DR cross sections was developed. The widths are calculated with Fermi's golden rule by substituting Rydberg orbitals for the free electron continuum coulomb orbital. It is shown that the calculated width converges exponentially as the effective principal quantum number of the Rydberg orbital increases. The threshold capture width is then easily obtained. Since atmospheric recombination involves very low energy electrons, the threshold capture widths are essential to the calculation of DR cross sections for the atmospheric species studied here. The approach described makes use of bound state computer codes already in use. A program that collects width matrix elements over CI wavefunctions for the initial and final states is described. Author

N83-20719# Mission Research Corp., Albuquerque, N. Mex.
BEAM BREAKUP AND IMAGE DISPLACEMENT INSTABILITIES IN HIGH CURRENT ELECTRON BEAM RACETRACK INDUCTION ACCELERATORS Interim Report
B. B. Godfrey and T. P. Hughes Sep. 1982 23 p refs
(Contract N00014-81-C-0647)
(AD-A121632; AMRC-R-410) Avail: NTIS HC A02/MF A01 CSCL 20/7

Beam breakup and image displacement instability growth rates for a 1 kA, 40 MeV electron beam racetrack induction accelerator are computed, The hypothetical device is taken to have four acceleration gaps, each with 0.2 MeV applied voltage and 15 ohm transverse impedance; the guide field is 2 kg. We find that the total amplification of the beam breakup mode is limited to 3.6 provided the cavity mode quality factor Q is 6. Image displacement mode growth is negligible. Thus, the negative mass instability, which grows about three times faster than the beam breakup instability for these parameters, is the dominant stability consideration. Probably, the negative mass instability can be controlled by sufficient spread in the electron energy. GRA

N83-20720# IBM Research Lab., San Jose, Calif.
STUDY OF SYNCHROTRON RADIATION FROM WET ELECTRODE SURFACES Report, 1 Oct. 1981 - 30 Sep. 1982
Lesser Blum and Joseph Gordon, III 30 Sep. 1982 4 p
(Contract N00014-82-C-0076)
(AD-A122044) Avail: NTIS HC A02/MF A01 CSCL 20/7

EXAFS spectra of halide ions adsorbed on Cu and Ag will be acquired to determine the site geometry of the adsorbed ion. In order to achieve sufficiently high sensitivity, the X-ray fluorescence emitted by the absorbing atom will be detected. Discrimination between surface and solution species will be achieved in one of two ways: by modulating the adsorption and subtracting the low coverage spectrum from the high coverage, or by removing the electrode from solution in such a way that a very thin layer of electrolyte remains on the surface. Author (GRA)

N83-20721# Naval Research Lab., Washington, D. C. Plasma Physics Div.
CREATION OF A CLOSED FIELD LINE COMPACT TOROID SYSTEM BY COUNTERSTREAMING ROTATING RELATIVISTIC ELECTRON BEAMS Final Report
J. D. Sethian, K. A. Gerber, A. E. Robson, and A. W. DeSilva (Sachs Freeman Associates, Inc.) 30 Sep. 1982 34 p refs Sponsored in part by DOE
(RR0110941)
(AD-A121344; NRL-4932) Avail: NTIS HC A03/MF A01 CSCL 20/7

The formation of a Compact Toroid using two sequentially injected rotating relativistic electron beams is discussed conceptually and in practice. A single beam is used to create a plasma in an open ended field-reversed configuration. A second counter streaming beam is then used to neutralize the axial current left by the first, and thereby form the closed configuration. Results of experiments that demonstrated the validity of this concept are presented. The propagation of the second beam was hindered by plasma external to the first beam channel. This plasma is inherent to the propagation of a rotating beam, and restricted the parameter range in which the compact toroid could be formed. Author (GRA)

N83-20722# Naval Research Lab., Washington, D. C.
CONSTRAINTS ON TRANSPORTABLE ION BEAM POWER
P. F. Ottinger, Shyke A. Goldstein, and D. Mosher 12 Nov. 1982 33 p refs
(AD-A121472; NRL-MR-4948) Avail: NTIS HC A03/MF A01 CSCL 20/7

Constraints on transportable high ion beam power are investigated in order to determine the number of modules required for a multi-modular light-ion ICF system. Electrostatic and electromagnetic stability constraints are examined as well as channel expansion

and energy loss considerations. It is found that less than ten modules are required to drive a high gain pellet if large radius transport channels are used in conjunction with beam bunching and final focusing. Author (GRA)

N83-20723# Massachusetts Inst. of Tech., Cambridge. Center for Materials Science and Engineering.
SCF-X ALPHA-SW CLUSTER MOLECULAR-ORBITAL MODELS OF CATALYSTS, ALLOYS, MAGNETIC MATERIALS, AND SUPERCONDUCTORS Interim Report
K. H. Johnson 29 Nov. 1982 50 p refs
(Contract N00014-81-K-0499; NR Proj. 056-757)
(AD-A122137; TR-5) Avail: NTIS HC A03/MF A01 CSCL 20/3

Recent self-consistent-field Xalpha scattered-wave (SCF-Xalpha-SW) molecular orbital studies of the electronic structures, chemical bonding, and related (e.g., catalytic, magnetic, and superconducting) properties of metal and alloy clusters are reviewed, including results for: (1) Li clusters, (2) Cu, Ni, Pd, and Pt clusters, (3) relativistic contributions to cluster electronic structure, (4) the interaction of hydrogen with Ni, Pd, and Pt clusters, (5) metal-support (Pt-SiO2 and Ru-SiO2) interactions, (6) magnetism of Fe clusters, (7) cluster of models of transition-metal impurities and their magnetic properties in copper and aluminum hosts, (8) cluster models of intermetallic compounds and solid-solution alloys, (9) cluster models of amorphous alloys, and (10) cluster molecular-orbital models of superconductors. GRA

N83-20724# Colorado Univ., Boulder. Dept. of Chemistry.
STUDIES PERTAINING TO AEROSOL FORMATION: NUCLEATION PHENOMENA CHARGING MECHANISMS AND GROWTH Final Report, 1 Jul. 1981 - 1 Jul. 1982
A. Welford Castleman, Jr. 1 Jul. 1982 295 p refs
(Contract DAAG29-79-C-0133)
(AD-A122705; ARO-16780.13-CH) Avail: NTIS HC A13/MF A01 CSCL 07/4

In recent years there has been a rekindling of interest in the field of aerosol science, with emphasis on studies of the properties of small particles and in the mechanisms by which they are formed and subsequently grow. This has been brought on partly by the advent of new experimental techniques which enable an investigation of the molecular properties of small aggregates, termed nucleation embryos, which give new insight into such fundamental problems as phase transitions, the formation, structure and reactivity of surfaces, and the nature and stability of the aerosol state. In terms of applied areas, such studies have a direct bearing on the fields of obscuration science, combustion research, catalysis, and the atmospheric sciences, to mention just a few. The research conducted during the grant period was addressed to three general areas: (1) Investigations of the energetics and structure of both ion and neutral-molecular complexes involving species which are important prenucleation embryos in both the natural and perturbed atmosphere; (2) Studies of the dynamics of cluster growth in expanding flows and concurrent assessments of the applicability of current theoretical models in assessing the energy barrier to nucleation; and (3) The development of techniques for determining the mechanisms of aerosol charging and related studies of cluster photostability. GRA

N83-20725# Los Alamos Scientific Lab., N. Mex.
DYNAMICS OF RADIATING FLUIDS
Dimitri Mihalas and Robert Weaver 1982 34 p refs Presented at the Los Alamos/CEA Conf., Paris, 19-23 Apr. 1982
(Contract W-7405-eng-36)
(DE83-012132; LA-UR-82-743) Avail: NTIS HC A03/MF A01

The role of radiation in the transport of energy and momentum in a combined matter-radiation fluid is reviewed. The transport equation for a moving radiating fluid is presented in both a fully Eulerian and a fully Lagrangian formulation, along with conservation equations describing the dynamics of the fluid. Special attention is paid to the problem of deriving equations that are mutually consistent in each frame, and between frames, to 0(v/c). A detailed analysis is made to show that in situations of broad interest, terms that are formally of 0(v/c) actually dominate the solution, demonstrating that it is essential (1) to pay scrupulous attention to the question of the frame dependence in formulating the equations, and (2) to solve the equations to 0(v/c) in quite general circumstances. These points are illustrated in the context of the nonequilibrium radiation diffusion limit, and a sketch of how the Lagrangian equations are to be solved is presented. DOE

N83-20726# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions.
REGULARITIES OF DEEP INELASTIC TRANSFER REACTIONS WITH THE 40Ar PROJECTILE
A. Popescu and D. G. Popescu 1981 7 p refs Submitted for publication
(DE82-701023; JINR-E-7-81-109) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

From the analysis of experimental data available on heavy ion reactions induced by the 40Ar projectile, new regularities of the cross sections of light nuclei were obtained. The factor of the THETASub(gg) dependence is found to behave exponentially with the Z of light nuclei. New isospin systematics of cross sections for deep inelastic transfer reactions are proposed. DOE

N83-20727# Erevan Inst. of Physics (USSR).
EXCITATION FUNCTION OF PHOTOPRODUCTION OF CUMULATIVE PROTONS ON NUCLEI
K. V. Alanakyan, M. D. Amaryan, R. A. Demirchyan, K. Sh. Egiyan, M. S. Oganianyan, and Yu. G. Sharabyan 1981 11 p refs
(DE82-700788; EFI-456(63)-80) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Experimental data on the energy dependence of pre-exponential constant Csub(rho) in the representation rho = f/o sub(t) = Csub(rho)exp(T/Tsub(0)) of the invariant normalized cross section of the cumulative proton photoproduction are reported. Cumulative protons are produced by the primary gamma-quanta in the 2-4.5 GeV energy range on C-12, Al-27, Cu-63, Sn-118, and Pb-208 in the gamma+A yields Pl+X reaction. Normalized cross section becomes invariant in the region of 4 GeV for heavy nuclei. DOE

N83-20728# Brookhaven National Lab., Upton, N. Y.
ANALYSIS OF VALENCE-ELECTRON STRUCTURES OF Y3AI5O12(YAG) AND Al2O3, CrO2 (RUBY), A STUDY OF CERTAIN PROPERTIES OF THESE LASER MATERIALS RELATED TO THEIR VALENCE-ELECTRON STRUCTURES
S. H. Yu (Jinan Univ.) and L. H. Yu 1982 14 p refs Presented at the Soc. of Photo-Optical Instrumentation Engr. Tech. Symp., Arlington, Va., 3 May 1982
(Contract DE-AC02-76CH-00016)
(DE82-016747; BNL-31380; CONF-820585-1) Avail: NTIS HC A02/MF A01

A direct method of determination of the valence-electron structure from its crystal structure was presented at the XIIth International Congress of Crystallography, at Ottawa, 1981. Here the method is applied to determine the valence-electron structures of Y3Al5O12 (YAG) and Al203, Cr2O3 (ruby) to see how certain properties of these laser materials are related to their valence-electron structures. The first point observed is the very strong, continuous, but zig-zag three-dimensional fractional covalent M-O bond nets (M = Al or Cr) being connected with the high melting points, the great resistance against the puncture by the strong laser beam. In the case of Nd-YAG, the distortion caused by the replacement of the Y atoms by almost the same size Nd atoms is small. On the other hand because of the similarity of the valence-electron structures of Al2O3 and Cr2O3, the replacement of Al atoms by the little larger size Cr atoms in small amount is easily understood. DOE

N83-20729# California Univ., Livermore. Lawrence Livermore Lab.
AB INITIO CALCULATIONS OF THE CHARGE STATE OF STOPPING IN A FINITE-TEMPERATURE TARGET
D. Bailey, Y. T. Lee, and R. M. More 25 Mar. 1982 17 p refs

Presented at the Gesellschaft fuer Schwerionenforschung Symp., Frankfort, 29 Mar. - 3 Apr. 1982 Submitted for publication
(Contract W-7405-eng-48)
(DE82-012736; UCRL-87455; CONF-820338-2) Avail: NTIS HC A02/MF A01

A calculation was made of the time dependent charge state of a heavy projectile traversing a finite-temperature target. The calculation uses an average-atom model to integrate the rate equations. DOE

N83-20730# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
MANUALLY CONTROLLED NEUTRON-ACTIVATION SYSTEM
Robert A. Johns and Glenn A. Carothers Jan. 1982 22 p refs
(Contract DE-AC09-76SR-00001)
(DE82-009269; DP-1622) Avail: NTIS HC A02/MF A01

A manually controlled neutron activation system, the Manual Reactor Activation System, was designed and built and has been operating at one of the Savannah River Plant's production reactors. With this system, samples can be irradiated for up to 24 hours and pneumatically transferred to a shielded repository for decay until their activity is low enough for them to be handled at a radiobench. The Manual Reactor Activation System was built to provide neutron activation of solid waste forms for the Alternative Waste Forms Leach Testing Program. Neutron activation of the bulk sample prior to leaching permits sensitive multielement radiometric analyses of the leachates. DOE

N83-20731# South Carolina Univ., Columbia. Dept of Physics and Astronomy.
ELECTRON-POSITRON ANNIHILATION FROM 3 TO 11 GeV Progress Report, 15 Mar. 1981 - 15 Mar. 1982
C. W. Darden 1982 11 p
(Contract DE-AS09-80ER-10690)
(DE82-014487; DOE/ER-10690/2; PR-2) Avail: NTIS HC A02/MF A01

The ARGUS collaboration started forming in mid 1978 to build and operate a new magnetic solenoid detector at the storage ring DORIS in Hamburg. With this detector and a rebuilt storage ring it would be possible to unravel the complicated multiparticle decays of charmed baryons and, more exciting, those of the recently discovered Tau mesons. By March of 1981, construction of the detector was well underway. Progress since then to 15 March 1982 is presented. DOE

N83-20732# Los Alamos Scientific Lab., N. Mex.
EVIDENCE FOR DELTA-HOLE COMPONENTS FROM PION REACTIONS
C. L. Morris 1982 13 p refs Presented at the Intern. Conf. on Spin Excitations in Nuclei, Telluride, Colo., 24-28 Mar. 1982
(Contract W-7405-eng-36)
(DE82-014054; LA-UR-82-916; CONF-82357-2) Avail: NTIS HC A02/MF A01

Some anomalies observed in pion induced reactions have been qualitatively explained with a model which includes admixtures in low lying nuclear states. Semiquantitative analysis of these effects indicates the amplitudes for the admixtures necessary to explain these effects are on the order of a few percent. Although a more rigorous theoretical treatment of this problem is necessary, it appears that pion induced reactions may provide a tool with which the spectroscopy of these admixtures can be studied. DOE

N83-20733# Los Alamos Scientific Lab., N. Mex.
SIMULATION OF A KLYSTRON GUN
W. Peter, M. A. Mostrom, J. L. Lunsford, and L. E. Thode Nov. 1982 7 p refs
(Contract W-7405-eng-36)
(DE83-002922; LA-9571) Avail: NTIS HC A02/MF A01

A two dimensional, fully relativistic particle in cell code was used to present time dependent and fully electromagnetic simulations of the operational characteristics of the XK-5 klystron gun. The beam current density and perveance were consistent with experimental and numerical results. The beam current density exhibited time dependent noise, but no significant electromagnetic gun oscillations were observed. It is concluded that a particle in cell simulation of the full klystron, including all cavities, is feasible but expensive. DOE

N83-20734# National Bureau of Standards, Washington, D.C.
STOPPING POWERS AND RANGES OF ELECTRONS AND POSITRONS
Martin J. Berger and Stephen M. Seltzer Aug. 1982 168 p refs Sponsored in part by DOE
(PB83-200289; NBSIR-82-2550) Avail: NTIS HC A08/MF A01 CSCL 20H

Tables of stopping powers and related data are given for electrons in 37 elements and 60 compounds, and for positrons in 8 materials. The tables include: (1) collision stopping powers (2) radiative stopping powers, (3) total stopping powers, (4) ranges computed in the continuous-slowing-down approximation, (5) radiation yields (fraction of electron energy converted into bremsstrahlung), and (6) the logarithmic derivatives of all these quantities with respect to the mean excitation energy of the medium. These results are given at 81 energies between 1000 MeV and 10 keV. Restricted collision stopping powers are tabulated for selected materials, with cut-off energies of 1, 10 and 100 keV. GRA

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N83-20735# Maryland Univ., College Park. Dept. of Physics and Astronomy.
HIGH-ENERGY-ACCELERATOR AND COLLIDING-BEAM USER GROUP Progress Report, 1 Mar. 1982 - 28 Feb. 1983
1983 140 p refs
(Contract DE-AC05-76ER-02504)
(DE83-003198; DOE/ER-02504/T2) Avail: NTIS HC A07/MF A01

Three major areas are covered, progress report, budget report, and proposed research program. The progress report covers the following major topics: electron-positron interactions at PETRA with PLUTO; neutrino-deuterium interactions in the 15 foot bubble chamber; hadron jet physics experiment at Fermilab; status of neutrino-electron and proton-proton scattering experiments at Los Alamos; and work on future projects. DOE

N83-20736# California Univ., Irvine. Dept. of Physics.
HIGH-ENERGY PHYSICS STUDY Final Report
J. Schultz [1983] 16 p refs
(Contract DE-AT03-76ER-70149)
(DE83-001516; DOE/ER-70149/T2) Avail: NTIS HC A02/MF A01

The activities of Task-B of the Experimental High Energy Physics Group at the University of California, Irvine are reported. Results from the Task-B group's major project, the DELCO experiment at the Stanford Linear Accelerator Center are described. This experiment consisted of a study of direct electrons produced in e( )e(+) collisions at SPEAR. Two other experiments engaged in by this group are discussed: a study of particular final states produced by long lived neutral kaons in hydrogen, and a search for massive muon pairs produced by K/sub L//sup o/ on a copper target. DOE

N83-20737# Oak Ridge National Lab., Tenn.
FRAMEWORK FOR EVALUATING THE UTILITY OF INCENTIVE SYSTEMS FOR RADIOACTIVE WASTE REPOSITORY SITING
S. A. Carnes, J. Soderstrom, J. Sorensen, E. Peelle, J. H. Reed, D. J. Bjornstad, and E. D. Copenhaver 1982 14 p refs Presented at the Waste Management Conf., Tucson, Ariz., 8 Mar. 1982

(Contract W-7405-eng-26)
(DE82-008846; CONF-820303-24) Avail: NTIS HC A02/MF A01

The importance of social and institutional issues in siting radioactive waste repositories has been recognized in recent years. Within this set of issues, the siting of repositories over the objections of members of potential host communities is viewed as especially problematic. Incentives to potential host communities have been suggested as a means of increasing local support for and offsetting local opposition to such facilities. Incentives are classified according to their function as mitigation, compensation or reward. Analysis of results of a 1980 survey (conducted by John Kelly, Complex Systems Group, University of New Hampshire) of 420 rural Wisconsin residents indicates that incentives may achieve the purpose of increasing support for and decreasing opposition to accepting a repository. Criteria for evaluating the utility of incentives are identified. It is suggested that meaningful evaluations of incentives can only be performed by members of potential host communities. DOE

N83-20738# Pacific Northwest Lab., Richland, Wash.
EFFECT OF ORGANIC COMPLEXANTS ON THE MOBILITY OF LOW-LEVEL-WASTE RADIONUCLIDES IN SOILS
J. L. Swanson Feb. 1982 13 p Presented at the ANS Meeting on Treatment and Handling of Radioactive Wastes, Richland, Wash., 19-22 Apr. 1982
(Contract DE-AC06-76RL-01830)
(DE82-012853; PNL-SA-10223; CONF-820424-8) Avail: NTIS HC A02/MF A01

The effect of certain organic complexants on the distribution of some radionuclides between solution and soil was measured. The complexants and radionuclides examined are some of those most likely to be present in low level waste disposal sites; Cs, Sr, Ni, Co, and Eu radionuclides, and EDTA, DTPA, oxalate, and citrate complexants. The effect of complexants was found to vary widely; in some systems there was no effect and in other systems there were large effects. In some cases slow rates of reaction have not allowed equilibrium measurements to be made. DOE

N83-20739# Pacific Northwest Lab., Richland, Wash.
DEVELOPMENT AND TESTING OF MATRICES FOR THE ENCAPSULATION OF GLASS AND CERAMIC NUCLEAR-WASTE FORMS
J. W. Wald, D. W. Brite, W. E. Gurwell, C. Q. Buckwalter, L. R. Bunnell, W. J. Gray, H. T. Blair, and J. M. Rusin Feb. 1982 116 p refs
(Contract DE-AC06-76RL-01830)
(DE82-008774; PNL-4098) Avail: NTIS HC A06/MF A01

The results of research on the matrix encapsulation of high level wastes over the past few years are discussed. The demonstrations and tests described were designed to illustrate how the waste materials are effected when encapsulated in an inert matrix. Candidate materials evaluated for potential use as matrices for encapsulation of pelletized ceramics or glass marbles were categorized into four groups: metals, glasses, ceramics, and graphite. Two processing techniques, casting and hot pressing, were investigated as the most promising methods of formation or densification of the matrices. The major results deal with the development aspects. However, chemical durability tests (leach tests) of the matrix materials themselves and matrix-waste form composites are also reported. Matrix waste forms can provide a low porosity, waste-free barrier resulting in increased leach protection, higher impact strength and improved thermal conductivity compared to unencapsulated glass or ceramic waste materials. DOE

N83-20740# Pacific Northwest Lab., Richland, Wash.
TECHNICAL AND ECONOMIC ASSESSMENT OF ALTERNATIVE DRY-STORAGE METHODS
R. C. Liikala, E. R. Johnson, and J. A. McBride Apr. 1982 13 p refs Presented at OECD Specialist Workshop on Techniques for the Dry Storage of Spent Fuel Elements, Madrid, Spain, 11 May 1982
(Contract DE-AC06-76RL-01830)
(DE82-014859; PNL-SA-10407; CONF-820578-2) Avail: NTIS HC A02/MF A01

The results of an assessment of four alternative methods of dry storage of spent nuclear fuel are presented in respect to the state of technology, licensability, implementation schedule and costs when the storage is used at a location to supplement existing pool storage facilities. The methods of storage considered were storage in casks, drywells, concrete silos, and air-cooled vaults. The impact of disassembly of spent fuel and storage of consolidated fuel rods was also determined. The economic assessments were based on the current projected storage requirements of a US utility operating twin 824 MWe pressurized water reactors. Costs were estimated for a number of combinations of storage mode and packaging processes and considered storage of both intact assemblies and unconsolidated rods. DOE

N83-20741# Pacific Northwest Lab., Richland, Wash.
COATED PARTICLE WASTE FORM DEVELOPMENT
K. H. Oma, C. Q. Buckwalter, and L. A. Chick Dec. 1981 173 p refs
(Contract DE-AC06-76RL-01830)
(DE82-011709; PNL-4108) Avail: NTIS HC A08/MF A01

Coated particle waste forms were developed as part of the multibarrier concept. Primary efforts were to coat simulated nuclear waste glass marbles and ceramic pellets with low temperature pyrolytic carbon (LT-PyC) coatings via the process of chemical vapor deposition (CVD). Fluidized bed coaters, screw agitated coaters, and rotating tube coaters were used. Coating temperatures were reduced by using catalysts and plasma activation. In general, the LT-PyC coatings did not provide the expected high leach resistance as previously measured for carbon alone. The coatings were friable and often spalled off the substrate. A totally different concept, thermal spray coating, was investigated as an alternative to CVD coating. Flame spray, wire gun, and plasma gun systems were evaluated using glass, ceramic, and metallic coating materials. Metal plasma spray coatings (Al, Sn, Zn, Pb) provided a two to three orders of magnitude increase in chemical durability. DOE

N83-20742# Los Alamos Scientific Lab., N. Mex.
LOS ALAMOS TRANSURANIC WASTE SIZE REDUCTION FACILITY
A. Briesmeister, J. Harper, B. Reich, and J. L. Warren 1982 16 p refs Presented at ANS Topical Meeting on Treatment and Handling of Radioactive Wastes, Richland, Wash., 19 Apr. 1982
(Contract W-7405-eng-36)
(DE82-012138; LA-UR-82-742; CONF-820424-7) Avail: NTIS HC A02/MF A01

A transuranic (TRU) Waste Size Reduction Facility (SRF) was designed and constructed at the Los Alamos National Laboratory during the period of 1977 to 1981. Engineering development, installation, and early test operations of the SRF were summarized. The facility incorporates a large stainless steel enclosure fitted with remote handling and cutting equipment to obtain an estimated 4:1 volume reduction of gloveboxes and other bulky metallic wastes. DOE

N83-20743# Japan Atomic Energy Research Inst., Tokyo.
PIC-CONTAINER FOR CONTAINMENT AND DISPOSAL OF LOW AND INTERMEDIATE LEVEL RADIOACTIVE WASTES
K. Araki, Y. Shinji, Y. Maki, K. Ishizaki, K. Minegishi, and G. Sudoh Mar. 1981 16 p refs
(DE82-701326; JAERI-M-9389) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Steel fiber reinforced polymer impregnated concrete (SFPIC) was investigated for low and intermediate level radioactive waste containers. The 60 L and 200 L containers were designed as pressure container (without equalizer) for 500 kg/square cm and 700 kg/sqaure cm. Polymerization of impregnated methylmethacrylate monomer was performed by 60 Co-gamma ray radiation and thermal catalytic polymerization respectively. Under the loading of 500 kg/square cm and 700 kg/square cm-outside hydraulic pressure, these containers were kept in their good condition. The observed maximum strains were about .001380 and .003950 at

the outside central position of container body for circumferential direction of the 60 L and 200 L container, respectively. The containers were immersed in deionized water for 400 days, nuclides were not leached from the container. The SFPIC container was suitable for containment and disposal of low and intermediate level radioactive wastes. DOE

N83-20744# Chem-Nuclear Systems, Inc., Bellevue, Wash.
FEASIBILITY OF APPLICATIONS OF MICROWAVE TECHNOLOGY FOR NUCLEAR POWER PLANT RADIOACTIVE WASTES Final Report
J. R. Potter and A. S. Woodle Apr. 1982 71 p refs Sponsored by EPRI
(DE82-903143; EPRI-903143; TPS-80-756) Avail: NTIS HC A04/MF A01

A study into the feasibility of using microwave energy for drying of radioactive wastes is presented. A review of process techniques now in use and proposed is also included and the basics of microwave heating is discussed. A review of tests performed includes: (1) scoping testing; and (2) laboratory testing in batch and continuous feed modes. Finally, a preliminary design is presented for both a batch system and continuous feed system for processing a minimum of 5000 cu. ft. of ion exchange resin beads per year. DOE

N83-20745# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
HIGH-LEVEL-WASTE IMMOBILIZATION
J. L. Crandall 1982 25 p refs Presented at ANS Topical Meeting on Treatment and Handling of Radioactive Wastes, Richland, Wash., 19 Apr. 1982
(Contract DE-AC09-76SR-00001)
(DE82-014172; DP-MS-82-31; CONF-820424-17) Avail: NTIS HC A02/MF A01

Risks, environmental effects, process feasibility, and costs for disposal of immobilized high level wastes in geologic repositories were analyzed. Results indicate that the disposal system safety has a low sensitivity to the choice of the waste disposal form. DOE

N83-20746# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
HIGH-LEVEL WASTE-FORM-PRODUCT PERFORMANCE EVALUATION
T. A. Bernadzikowski, J. S. Allender, J. A. Stone, D. E. Gordon, T. H. Gould, Jr., and C. F. Westberry, III 1982 16 p refs Presented at 84th Ann. Meeting of the Am. Ceramic Soc., Cincinnati, Ohio, 2 May 1982
(Contract DE-AC09-76SR-00001)
(DE82-013897; DP-MS-81-114; CONF-820547-2) Avail: NTIS HC A02/MF A01

Seven candidate waste forms were evaluated for immobilization and geologic disposal of high level radioactive wastes. The waste forms were compared on the basis of leach resistance, mechanical stability, and waste loading. All forms performed well at leaching temperatures of 40, 90, and 150 C. Ceramic forms ranked highest, followed by glasses, a metal matrix form, and concrete. DOE

N83-20747# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
REVIEW OF POTENTIAL HOST ROCKS FOR RADIOACTIVE WASTE DISPOSAL IN THE SOUTHERN PIEDMONT
I. W. Marine and H. W. Bledsoe 1982 11 p refs Presented at Geological Soc. of Am. Southeastern Section Meeting, Washington, D. C., 25 Mar. 1982
(Contract DE-AC09-76SR-00001)
(DE82-014394; DP-MS-81-96; CONF-820352-2) Avail: NTIS HC A02/MF A01

A federal geologic repository is being considered for the disposal of radioactive waste. The geological literature on the Southern Piedmont was studied to identify rock bodies worthy of field exploration for site selection. The study was geotechnical in nature and no consideration was given to socioeconomic factors. There were 13 geotechnical criteria applied to arrive at a recommendation for further studies on 29 rock bodies. In general, information from the literature included the geometry and depth of the rock body, the lithology and mineralogy of the body, mineral resources, and seismicity of the area. Some rock properties, such as physical, chemical, and thermal characteristics can be inferred from the lithology and mineralogy of the rock. DOE

N83-20748# Department of Energy, Washington, D. C.
NATIONAL PLAN FOR SITING HIGH-LEVEL RADIOACTIVE WASTE REPOSITORIES AND ENVIRONMENTAL ASSESSMENT: PUBLIC DRAFT
Feb. 1982 205 p refs
(DE82-009290; DOE/NWTS-4; DOE/EA-151) Avail: NTIS HC A10/MF A01

The process used to find sites suitable for disposal of high level radioactive waste is described. Existing and planned activities for screening successively smaller portions of land to identify suitable candidate sites, and for subsequently selecting one or more of these sites for permanent disposal of radioactive wastes are discussed. Environmental effects of the proposed action, including the anticipate range of field studies to characterize various land areas and reasonable alternative siting strategies, are assessed. The environmental assessment provides the basis for a finding of whether or not implementation of this plan will result in significant environmental impacts. DOE

N83-20749# Rockwell International Corp., Canoga Park, Calif. Energy Systems Group.
STABILITY OF CERAMIC WASTE FORMS IN POTENTIAL REPOSITORY ENVIRONMENTS: A REVIEW
R. J. Johnston and R. A. Palmer 31 Mar. 1982 50 p refs
(Contract DE-AC09-79ET-41900)
(DE82-013288; DOE/ET-41900/13; ESG-DOE-13364) Avail: NTIS HC A03/MF A01

Scenarios for geologic disposal of high level nuclear waste include the eventual intrusion of groundwater into the repository. Reactions in the system and eventual release of the radionuclides are controlled by the chemistry of the groundwater, the surrounding rock, the waste form, engineered barrier materials, temperature, and pressure of the system. Interactions within the wasteform/host rock/groundwater system at various points in its lifetime are evaluated. Results from leaching experiments are presented as a basis for comparison. The factors involved in studying the complete system are discussed so that future research may avoid some of the oversights of past research. Although relatively little hard data on prototype wasteform/repository system interactions exist at this time, the available data and their implications are discussed. Sorption studies and models for predicting radionuclide migration are presented with a study of the factors involved. B.G.

N83-20750# Sandia Labs., Albuquerque, N. Mex.
SNAP OPERATING SYSTEM (SOS) USER'S GUIDE
J. D. Sabuda, J. Polito, J. L. Walker, and F. H. Grant, III Mar. 1982 440 p refs
(Contract DE-AC04-76DP-00789)
(DE82-014496; NUREG/CR-2604; SAND-82-7018) Avail: NTIS HC A19/MF A01

The SNAP Operating System (SOS) is a FORTRAN 77 program which provides assistance to the safeguards analyst who uses the Safeguards Automated Facility Evaluation (SAFE) and the Safeguards Network Analysis Procedure (SNAP) techniques. Features offered by SOS are a data base system for storing a library of SNAP applications, computer graphics representation of SNAP models, a computer graphics editor to develop and modify SNAP models, a SAFE-to-SNAP interface, automatic generation of SNAP input data, and a computer graphics postprocessor for SNAP. The SOS User's Guide is designed to provide the user with the information necessary to use SOS effectively. Examples are used throughout to illustrate the concepts. The format of the user's guide follows the same sequence as would be used in executing an actual application. DOE

N83-20751# Los Alamos Scientific Lab., N. Mex.
CURRENT STATUS OF THE MULTI-ISOTOPIC TRANSURANIC WASTE-ASSAY SYSTEM
W. E. Kunz and J. T. Caldwell 1982 19 p refs Presented at ANS Topical Meeting on Treatment and Handling of Radioactive Wastes, Richland, Wash., 19 Apr. 1982
(Contract W-7405-eng-36)
(DE82-012135; LA-UR-82-787; CONF-820424-6) Avail: NTIS HC A02/MF A01

A 208-1 barrel sized working version of a multiisotopic transuranic assay system using both passive neutron multiplicity and pulsed active measurements to identify and quantify spontaneous neutron emitters and fissile TRU isotopes was designed and constructed. The system can separately quantify up to seven individual transuranic isotopes under favorable conditions with the intrinsic sensitivity to screen or assay barrels at or below the 10 nCi/g transuranic level. Three sigma sensitivity for Pu-239 is measured at about 0.5 mg. A large range of waste matrix materials was accommodated by the system, as well as extremes in both gamma ray and neutron backgrounds. DOE

N83-20752# California Univ., Livermore. Lawrence Livermore Lab.
SINTERING OF SYNROC D
Gaythia Robinson 1 Jun. 1982 30 p refs
(Contract W-7405-eng-48)
(DE82-017118; UCID-19404) Avail: NTIS HC A03/MF A01

Sintering was investigated as a method for the mineralization and densification of high-level nuclear defense waste powder. Studies were conducted on Synroc D composite powder LS04. Optimal densification was found to be highly dependent on the characteristics of the starting material. Powder subjected to milling, which was believed to reduce the level of agglomeration and possibly particle size, was found to densify better than powder not subjected to this milling. Densities of greater than 95% of theoretical could be achieved for samples sintered at 1150 to 1200 C. Mineralogy was found to be as expected for Synroc D. DOE

N83-20753# California Univ., Livermore. Lawrence Livermore Lab.
RECENT US TARGET-PHYSICS-RELATED RESEARCH IN HEAVY-ION INERTIAL FUSION: TARGET GAINS AND CONSTRAINTS ON ACCELERATOR DESIGN
James W-K. Mark 9 Mar. 1982 42 p refs Presented at the GSI Symp. on Accelerator Aspects of Ion Fusion, Darmstadt, West Germany, 29 Mar. 1982 2 Vol.
(Contract W-7405-eng-48)
(DE82-012783; UCRL-87378-Pt-1; CONF-820338-3-Pt-1) Avail: NTIS HC A03/MF A01

Inertia fusion targets were designed for use with heavy ion accelerators as drivers in fusion energy power plants. In the interest of providing inputs for understanding the tradeoffs among accelerator designs, an initial survey was carried out regarding target gain versus parameters of relevance. Target gain was related to the beam energy, power, focal radius, and ion range. More comprehensive discussion was made by posing target gain constraints on the beam occupied phase space volume of the linacs. Simplified models of accelerator final focus and beam transport in near vacuum fusion reaction chambers were discussed. DOE

N83-20754# California Univ., Livermore. Lawrence Livermore Lab.
RECENT US TARGET-PHYSICS-RELATED RESEARCH IN HEAVY-ION INERTIAL FUSION: SIMULATIONS FOR TAMPED TARGETS AND FOR DISK EXPERIMENTS IN ACCELERATOR TEST FACILITIES
James W-K. Mark 22 Mar. 1982 29 p refs Presented at the GSI Symp. on Accelerator Aspects of Ion Fusion, Darmstadt, West Germany, 29 Mar. 1982
(Contract W-7405-eng-48)
(DE82-012799; UCRL-87378-Pt-2; CONF-820338-3-Pt-2) Avail: NTIS HC A03/MF A01

Calculations suggest that experiments relating to disk heating, as well as beam deposition, focusing and transport can be performed within the context of design proposals for accelerator test facilities. Since the test facilities have lower ion kinetic energy and beam pulse power as compared to reactor drivers, high beam intensities can be achieved at the focal spot by using short focal distance and properly designed beam optics. In this regard, the low beam emittance of suggested multibeam designs are very useful. Possibly even higher focal spot brightness can be obtained by plasma lenses which involve external fields on the beam which is stripped to a higher charge state by passing through a plasma cell. Preliminary results results suggest that intensities approximately 10 to the 13th power to 10 to the 14th power W/sq cm are achievable. Given these intensities, deposition experiments with heating of disks to greater than a million degrees Kelvin (100 eV) are expected. DOE

N83-20755# Sandia Corp., Albuquerque, N. Mex.
SUBSEABED DISPOSAL PROGRAM. VOLUME 2, PART 2: APPENDICES Annual Report, Jan. - Sep. 1981
K. R. Hinga, ed. Jul. 1982 937 p refs
(Contract DE-AC04-76DP-00789)
(DE82-020854; SAND-82-0664-Vol-2-Pt-2) Avail: NTIS HC A99/MF A01

The progress and evaluation of the status of the subseabed disposal program is reported. The report covers the period January to September 1981 because the program is shifting from a calendar year to a fiscal year reporting period. The volume it has been split into two parts for publication purposes. Part 1 contains Appendices A to Z; part 2 contains Appendices AA to TT. Separate abstracts are prepared for each appendix for inclusion in the energy data base. DOE

N83-20231# Electricite de France, Clamart. Direction des Etudes et Recherches.
UNIFIED PROBABILISTIC APPROACH METHOD TO THE SAFETY OF MECHANICAL SYSTEMS: EXAMPLE OF AN APPLICATION IN THE NUCLEAR FIELD [METHODE UNIFIEE D'APPROACHE PROBABILISTE DE LA SECURITE DES SYSTEMES MECHANIQUES. EXEMPLE D'APPLICATION DANS LE DOMAINE NUCLEAIRE]
J. F. Barbet, A. Delage (Soc. Generale des Travaux Electriques), and J. C. Ligeron (Soc. Generale des Travaux Electriques) *In* ESA Reliability and Maintainability Sep. 1982 p 371-381 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

74 OPTICS

Includes light phenomena.

N83-20756 Royal Aircraft Establishment, Farnborough (England). Materials Dept.
SOME TECHNIQUES IN ANALYTICAL OPTICAL MICROSCOPY
A. J. Christopher Jun. 1982 32 p refs
(BR84947; TM-MAT-397) Copyright. Avail: Issuing Activity

A useful range of optical microscopical facilities was built up in the Analytical and General Chemistry Section, Materials Department of the Royal Aircraft Establishment. The equipment and the techniques for which it can be used are described and examples of applications are given. Detailed procedures for some techniques are given in the Appendices. Author

N83-20757*# National Aeronautics and Space Administration. Pasadena Office, Calif.
INTEGRATING IR DETECTOR IMAGING SYSTEMS Patent Application
Gary C. Bailey, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 25 Aug. 1981 13 p Sponsored by NASA
(NASA-Case-NPO-15805-1; US-Patent-Appl-SN-296137) Avail: NTIS HC A02/MF A01 CSCL 20F

An integrating IR detector array for imaging is provided in a

hybrid circuit with InSb mesa diodes in a linear array, a single J-FET preamplifier for readout, and a silicon integrated circuit multiplexer. Thin film conductors in a fan out pattern deposited on an Al2O3 substrate connect the diodes to the multiplexer, and thick film conductors also connect the reset switch and preamplifier to the multiplexer. Two phase clock pulses are applied with a logic return signal to the multiplexer through a triax comprised of three thin film conductors deposited between layers. A lens focuses a scanned image onto the diode array for horizontal read out while a scanning mirror provides vertical scan. B.G.

N83-20758# Twente Univ. of Technology, Enschede (Netherlands).
MODERN DISPLAY TECHNOLOGIES AND APPLICATIONS
D. Bosman, ed. Neuilly-Sur-Seine, France AGARD Oct. 1982 219 p refs
(AGARD-AR-169; ISBN-92-835-1438-6) Avail: NTIS HC A10/MF A01

Analysis of both current and anticipated requirements for information displays in military avionics; identification of display applications where new technologies in visual displays have the greatest impact on military avionics; and survey the present status and potential for further development of a wide range of modern display technologies are presented. An engineering view on vision and displays explained the technical factors affecting the perception of displayed data, sampling and addressing, the human factors affecting display design and use, and the use of color in displays. A description of technologies included the cathode ray tube, vacuum fluorescent tubes, liquid crystal displays, light emitting diodes, electro-luminescent displays, electrochemical displays and other display technologies. The application of display technologies to military avionics was examined in the areas of classifications, head up displays, head down displays, helmet mounted systems, keyboard displays, and alphanumeric modules. An assessment is made of modern display technology potential. Author

N83-20759# Carnegie-Mellon Univ., Pittsburgh, Pa. Inst. for Robotics.
A REPRESENTATION FOR VISUAL INFORMATION Interim Report
James L. Crowley Nov. 1981 238 p refs
(Contract N00039-79-Z-0169; Grant NSF ARP-75-08154)
(AD-A121443; CMU-RI-TR-82-7) Avail: NTIS HC A11/MF A01 CSCL 20/6

This dissertation presents a new technique for representing digital pictures. The principal benefit of this representation is that it greatly simplifies the problem of finding the correspondence between components in the description of two pictures. This representation technique is based on a new class of reversible transforms (the Difference of Low Pass or DOLP transform). A fast algorithm for computing the DOLP transform is then presented. This algorithm, called cascade convolution with expansion is based on the auto-convolution scaling property of Gaussian functions. Techniques are then described for constructing a structural description of an image from its Sampled DOLP transform. The symbols in this description are detected by detecting local peaks and ridges in each band-pass image, and among all of the band-pass image. This description has the form of a tree of peaks, with the peaks interconnected by chains of symbols from the ridges. The tree of peaks has a structure which can be matched despite changes in size, orientation, or position of the gray scale shape that is described. GRA

N83-20760# Rome Air Development Center, Griffiss AFB, N.Y. Strategic Surveillance Branch.
USE OF ADAPTIVE OPTICS IN VISIBLE WAVELENGTH C3I SYSTEMS
Patrick J. Martone Oct. 1982 29 p refs
(AF Proj. D021)
(AD-A121359; RADC-TR-82-265) Avail: NTIS HC A03/MF A01 CSCL 20/6

This document presents an introduction to compensation for atmospheric turbulence by use of adaptive optics. The performance of groundbased visible wavelength C3I (Command Control and Intelligence) systems for the purpose of communications with or surveillance of space objects is severely degraded by the atmosphere. Adaptive Optics can compensate for these effects by measuring induced phase aberrations and cancelling them by impressing the phase conjugate onto the aberrated wavefront. A brief discussion of atmospheric turbulence is provided, followed by an introduction to the concept of adaptive optics. C3I systems concepts currently involving adaptive optics are discussed, along with technology objectives for future C3I systems. Author (GRA)

N83-20761# Maryland Univ., College Park. Dept. of Physics and Astronomy.
COHERENT SCATTERING OF LIGHT INTO HIGH FREQUENCY RADIOWAVES Annual Report, 1 Oct. 1981 - 30 Sep. 1982
J. Weber (California Univ.) Sep. 1982 24 p
(Grant AF-AFOSR-3399-77; AF Proj. 2305)
(AD-A121798; AFOSR-82-1013TR) Avail: NTIS HC A02/MF A01 CSCL 20/6

The coherent interaction of light with an ensemble of nuclear magnetic moments in a crystal is being studied at low temperatures, together with coherent Raman scattering by electrons. Author (GRA)

N83-20762# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Sensor Evaluation Branch.
MATH MODEL FOR PREDICTION OF INFRARED SIGNATURES Final Report, 1 Dec. 1980 - 30 Jun. 1981
William L. Foley Aug. 1982 55 p refs
(AF Proj. 2004)
(AD-A121768; AFWAL-TR-81-1194) Avail: NTIS HC A04/MF A01 CSCL 17/5

This report covers the development and implementation of math model for use in predicting surface temperature of natural and man-made features. The model utilizes time-varying environmental inputs as well as constant thermal parameters to calculate time-varying surface temperature profiles. Formulations describe solar, conductive, radiative, convective, rain and evaporative effects on air/surface boundary. Finite difference methods are used to calculate time-varying temperature of feature surfaces. Features may be elevated or coincident with Earth's surface. Temperature or radiance from vegetative growth may also be predicted. Model has been programmed and is operational in laboratory. Model will be incorporated into an overall laboratory program for test and validation which will commence September 1981 and, as currently scheduled, continue over a 3-year period. Preliminary validation has been obtained using available sample data inputs. Validation at present is limited, based on data availability, to dry season only. Author (GRA)

N83-20763# Cincinnati Univ., Ohio. Dept. of Electrical and Computer Engineering.
INTEGRATION OF A DETECTOR ARRAY WITH AN OPTICAL WAVEGUIDE STRUCTURE Interim Technical Report, 15 Mar. 1981 - 14 Mar. 1982
J. T. Boyd 15 Jul. 1982 24 p refs
(Grant AF-AFOSR-0130-81)
(AD-A121406; AFOSR-83-0917TR) Avail: NTIS HC A02/MF A01 CSCL 20/6

Current research under grant involves integration of a detector array with an optical waveguide structure and applications to signal processing. The present report summarizes progress achieved in Part 1 of this research program (March 15, 1981 - March 14, 1982). The main accomplishments resulting from research performed during this period include a number of accomplishments in the area of laser processing of semiconductors and demonstration of graded index SiO2 waveguides having very low scattering loss. Significant progress was also made with regard to implementation of a log converting array sensor element for charge-coupled device (CCD) image arrays and demonstration of the advantages of edge detection of long wavelength radiation by silicon photodetectors. Results in each of these areas are discussed in the following sections. GRA

N83-20764# Battelle Columbus Labs., Ohio.
OPTICAL WAVEGUIDE SPATIAL FILTERS Annual Technical Report
C. M. Verber, R. P. Kenan, and J. R. Busch 30 Jun. 1982 133 p refs
(Contract F49620-79-C-0044; AF Proj. 2305)
(AD-A121681; AFOSR-82-1000TR) Avail: NTIS HC A07/MF A01 CSCL 20/6

Research leading to the development of an Integrated-Optical Spatial Light Modulator (IOSLM) and its utilization as a component in a space-integrating correlator for binary words is presented. Principles of operation, design procedures, and characterization data are discussed. Other uses for the IOSLM are presented and commented upon. The full range of the research-from feasibility experiment through characterization of a 32 Mbit/sec correlator-is presented. Author (GRA)

N83-20765# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
GRADIENT SPACE UNDER ORTHOGRAPHY AND PERSPECTIVE
Steven A. Shafer, Takeo Kanade, and John Kender (Columbia Univ.) 24 May 1982 24 p refs Submitted for publication
(Contract F33615-81-K-1539; ARPA Order 3597)
(AD-A122100; CMU-CS-82-123) Avail: NTIS HC A02/MF A01 CSCL 20/6

Machworth's gradient space has proven to be a useful tool for image understanding. However, descriptions of its important properties have been somewhat scattered in the literature. This paper develops and summarizes the fundamental properties of the gradient space under orthography and perspective, and for curved surfaces. While largely a recounting of previously published results, there are a number of new observations, particularly concerning the gradient space and perspective projection. In addition, the definition and use of vector gradients as well as surface gradients provides concise notation for several results. The properties explored in the paper include the orthographic and perspective projections themselves; the definition of gradients; the gradient space consequences of vectors (edges) belonging to one or more surfaces, and of several vectors being contained on a single surface; and the relationships between vanishing points, vanishing lines, and the gradient space. The paper is intended as a study guide for learning about the gradient space, as well as a reference for researchers working with gradient space.
Author (GRA)

N83-20766# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
INCREMENTAL ACQUISITION OF A THREE-DIMENSIONAL SCENE MODEL FROM IMAGES
Martin Herman, Takeo Kanade, and Shigeru Kuroe Oct. 1982 27 p refs
(Contract F33615-81-K-1539; ARPA Order 3597)
(AD-A122133; CMU-CS-82-139) Avail: NTIS HC A03/MF A01 CSCL 20/6

We describe the current state of the 3D Mosaic project, whose goal is to incrementally acquire a 3D model of a complex urban scene from images. The notion of incremental acquisition arises from the observations that (1) single images contain only partial information about a scene, (2) complex images are difficult to fully interpret, and (3) different features of a given scene tend to be easier to extract in different images because of differences in viewpoint and lighting conditions. In our approach, multiple images of the scene are sequentially analyzed so as to incrementally construct the model. Each new image provides information which refines the model. We describe some experiments toward this end. Our method of extracting 3D shape information from the images is stereo analysis. Because we are dealing with urban scenes, a junction-based matching technique proves very useful. This technique produces rather sparse wire-frame descriptions of the scene. A reasoning system that relies on task-specific knowledge generates an approximate model of the scene from the stereo output. Gray scale information is also acquired for the laces in the model. Finally, we describe an experiment in combining two views of the scene to obtain a refined model. GRA

N83-20767# Utah Univ., Salt Lake City. Dept. of Bioengineering.
EXTINCTION BY DIELECTRIC PARTICLES AT OPTICAL AND INFRARED WAVELENGTHS Final Report, 1 Apr. 1981 - 30 Sep. 1982
Peter W. Barber 30 Nov. 1982 4 p refs
(Contract DAAG29-81-K-0067)
(AD-A122692; ARO-17066.5-GS; Rept-1) Avail: NTIS HC A02/MF A01 CSCL 20/6

The light scattering properties of nonspherical particles have been investigated. A volume integral equation technique suitable for cubical or high axial ratio particles has been developed and tested. A hybrid differential-integral technique suitable for inhomogeneous particles has also been developed and tested. The elements of the Mueller matrix have been calculated for spheroids and super spheroids. A framework for parameterizing both particle shape and scattering output has been proposed as a mechanism for relating these two quantities. Graphical techniques permit rapid analysis of angular scattering results. GRA

N83-20768# Swedlow, Inc., Garden Grove, Calif.
DESIGN AND DEVELOPMENT OF MONOLITHIC ACRYLIC FRESNEL LENSES FOR USE IN POINT-FOCUS PV SYSTEMS
Craig M. Childers Dec. 1981 47 p refs
(Contract DE-AC04-76DP-00789)
(DE82-007554; SAND-81-7040) Avail: NTIS HC A03/MF A01

The design, tooling, manufacturing, and testing of a new cast acrylic Fresnel lens array which is used as a solar concentrator are described. The array consists of twenty-five (25) single lens elements which are 6.7 inches square; the overall array size is 34.5 inches by 34.5 inches which includes a mounting border. These lens arrays will be used to focus sunlight at a net concentration ratio of 96/1 on passively cooled silicon cells in state-of-the-art concentrator modules. Tests at Swedlow and Sandia indicated that lenses developed for this program exceeded the lens transmission efficiency goal of 79%. DOE

N83-20769# Sandia Labs., Albuquerque, N. Mex.
FIBER OPTICS/MICROPROCESSOR READOUT FOR AN ESD SIMULATOR
J. P. Wolfe and M. M. Robertson Mar. 1982 28 p refs
(Contract DE-AC04-76DP-00789)
(DE82-014535; SAND-82-0144) Avail: NTIS HC A03/MF A01

There are a number of applications for accelerometers, environmental sensing devices (ESDs), that measure an instantaneous acceleration and/or an integrated accelertion in various weapons and missile systems. Optical means of making those measurements and a microprocessor-based electronic system for reducing those measurements to a usable output were completed for a simulated ESD. This unit utilized an optical code plate, with opaque and clear regions, which was transported past an optical fiber that illuminated the code plate with light from a light emitting diode (LED). Two other fibers intercepted the light from the source fiber as it was modulated by the moving code plate. In addition to the linear motion of the code plate, it was oscillated to simulate vibrations induced in an ESD during an launch sequence or other normal opertions. The modulated light was transmitted to two photodiodes whose output went to signal processing electronics, and thence to a readout. DOE

N83-20770# California Univ., Livermore. Lawrence Livermore Lab.
PHYSICS OF MIRROR SYSTEMS
R. F. Post May 1982 52 p refs Presented at the Intern. Conf. on Plasma Phys., Goteborg, 7 Jun. 1982
(Contract W-7405-eng-48)
(DE82-015908; UCRL-87677; CONF-820618-4) Avail: NTIS HC A04/MF A01

In recent years the emphasis in research on the magnetic mirror approach to fusion has been shifted to address what are

essentially economically-motivated issues. The introduction of the tandem mirror idea solved in principal the problem of low Q (low fusion power gain) of mirror-based fusion systems. In order to optimize the tandem mirror idea from an economic standpoint, some important improvements have been suggested. These imporvements include the thermal barrier idea of Baldwin and Logan and the axicell concept of Kesner. These new modifications introduce some special physics considerations. Among these are: (1) the MHD stability properties of high energy electron components in the end cells; (2) the optimization of end-cell magnetic field configurations with the objective of minimizing equilibrium parallel currents; and (3) the suppression of microstabilities by use of sloshing ion distributions. DOE

N83-20771# Central Inst. for Industrial Research, Oslo (Norway).
FOCUSING AT SMALL ANGULAR APERTURES IN THE DEBYE AND KIRCHHOFF APPROXIMATIONS
J. J. Stamnes and B. Spjelkavik 22 May 1981 17 p refs
(PB83-100651; Rept-78-01-44-18; ISBN-82-7267-148-4) Avail: NTIS HC A02/MF A01 CSCL 20F

The classical problem of diffraction of a converging spherical wave by a circular aperture is re-examined. On the basis of the Kirchhoff approximation and the paraxial approximation, a new expression is derived for the field in the focal region. The new expression differs from the classical one in that it depends not only on the angular aperture, but also on the distance from the aperture to the focal point. The classical result is shown to be based on the Debye approximation and the paraxial approximation. Compared with the classical result, the new result shows an inward shift of the point of maximum intensity on-axis. In the classical focal plane, the new result is identical to the classical one, except for a parabolic phase factor. GRA

N83-20772# Central Inst. for Industrial Research, Oslo (Norway).
INTENSITY CORRELATION METROLOGY: A COMPARATIVE STUDY
Hans M. Pedersen 22 May 1981 41 p refs
(PB83-100669; Rept-78-01-44-19; ISBN-82-7267-213-8) Avail: NTIS HC A03/MF A01 CSCL 20F

The statistical theory of fully developed, coherent speckle patterns is compared to classical coherence theory. It is shown that speckle correlations are directly analogous to the Hanbury Brown and Twiss effect. On that background, a unified description is given for a number of measurement techniques based on intensity correlation measurements in scattered laser light: holographic interferometry, speckle pattern interferometry, speckle photography, stellar speckle interferometry, laser Doppler velocimetry, and intensity correlation spectroscopy. GRA

N83-20773# Central Inst. for Industrial Research, Oslo (Norway).
FOCUSING OF ENERGY: DIFFRACTION, ASYMPTOTICS AND CATASTROPHES
Jakob J. Stamnes 1981 45 p refs
(PB83-100677; Rept-78-01-44-21; ISBN-82-7267-3983) Avail: NTIS HC A03/MF A01 CSCL 20F

Semiuniform asymptotic methods are developed for computing wavefields in regions of shadow boundaries, caustics and cusps. The theoretical and practical importance of these methods, as well as their connection with catastrophe theory are discussed. The methods are applied to study the diffraction of a spherical wave by a circular aperture. GRA

N83-20774# Central Inst. for Industrial Research, Oslo (Norway).
FOCUSING OF ENERGY: EVALUATION OF DIFFRACTION INTEGRALS USING LOCAL PHASE AND AMPLITUDE APPROXIMATIONS
J. J. Stamnes, B. Spjelkavik, and H. M. Pedersen 25 Nov. 1981 36 p refs
(PB83-100685; Rept-78-01-44-22; ISBN-82-7267-407-6) Avail: NTIS HC A03/MF A01 CSCL 20F

An efficient method for computing diffraction integrals is presented. It is based on an idea by Hopkins. The integration domain is broken up into subdomains, in each of which the phase and amplitude are approximated by simple functions which make it possible to evaluate the resulting integral in terms of known functions. While Hopkins employed a linear approximation to the phase and a constant approximation to the amplitude, here both the phase and the amplitude are approximated by parabolas. A comparison of the results of the method with those of Hopkins' method shows that the former requires fewer subdomains and less computation time to yield a desired accuracy. Another advantage of the method is that it can be applied to apertures of a general shape without significant loss of accuracy. GRA

N83-20775# Central Inst. for Industrial Research, Oslo (Norway).
FOCUSING AND IMAGING: DIFFRACTION BY CIRCULAR APERTURES. 1: METHOD OF LINEAR PHASE AND AMPLITUDE APPROXIMATION
T. Gravelsater and J. J. Stamnes 22 Jun. 1982 35 p refs Submitted for publication
(PB83-100727; Rept-82-03-03-1; ISBN-82-7267-463-7) Avail: NTIS HC A03/MF A01 CSCL 20F

Efficient methods are developed for computing the field diffracted by circular apertures. As an illustration, the methods are applied to compute the image field of a holographic lens for IR radiation. GRA

N83-20776# Central Inst. for Industrial Research, Oslo (Norway).
FOCUSING AND IMAGING: A UNIFORM ASYMPTOTIC THEORY OF DIFFRACTION OF APERTURES
J. J. Stamnes 10 Jun. 1982 69 p refs
(PB83-100735; ISBN-82-7267-461-0; RNCSIR-82-03-03-2) Avail: NTIS HC A04/MF A01 CSCL 20F

Simple and explicit formulas that represent uniform asymptotic aproximations to double integrals are derived and applied to obtain a uniform asymptotic theory of diffraction by apertures. The formulas are used to evaluate the diffracted field or its angular spectrum in regions in which the results of ordinary asymptotic theories, breakdown. Thus, the results remain valid in regions containing geometrical shadow boundaries or caustics of diffracted rays. To illustrate their general applicability, they are applied to two diffraction problems involving a circular aperture: for a diverging spherical incident wave. The diffracted field is computed; and, for a converging incident wave, both its angular spectrum and its diffracted field far from focus are computed. GRA

N83-20777# National Bureau of Standards, Boulder, Colo.
OPTICAL FIBER CHARACTERIZATION: BACKSCATTER, TIME DOMAIN BANDWIDTH, REFRACTED FROM NEAR FIELD AND INTERLABORATORY COMPARISONS, VOLUME 1
B. L. Danielson, G. W. Day, D. L. Franzen, E. M. Kim, and M. Young Sep. 1982 208 p refs Sponsored in part by Department of Defense and Army Communications Research and Development Command
(PB83-111609; NBS-SP-637-Vol-1; LC-82-600563) Avail: NTIS HC A10/MF A01 CSCL 20F

Optical fiber waveguide measurements are described. Systems to determine the backscatter, bandwidth, and index profile are covered in detail. Measurement comparisons between laboratories are given for fiber attenuation, bandwidth, numerical aperture, and core diameter. GRA

N83-19770*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Communications Systems Research Section.
CAPACITY AND CUTOFF RATE OF (M+1)-ARY DECISION RULES FOR NOISY M-ARY OPTICAL PPM CHANNEL
P. J. Lee *In its* The Telecommun. and Data Acquisition Rept. 15 Feb. 1983 p 43-50 refs (For primary document see N83-19766 10-12)
Avail: NTIS HC A11/MF A01 CSCL 20F

N83-20096# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ADVANCES IN RESEARCH ON SOLID OPTICAL THIN FILM STRUCTURES
Zhong Yongan *In its* Phys. (Selected Articles) (FTD-IS(RS)T-0752-82) 1 Nov. 1982 p 19-34 refs Transl. into ENGLISH from Wuli

(China), v. 10, no. 11, Nov. 1981 p 666-671 (For primary document see N83-20094 10-36)
Avail: NTIS HC A03/MF A01 CSCL 20/6

N83-20693# Vanderbilt Univ., Nashville, Tenn. Dept. of Psychology.
THE EFFECT OF DEPTH POSITION ON STIMULUS INTERACTION
Robert Fox *In* NAS-NRC Three-Dimensional Displays 1982 p 7-28 refs (For primary document see N83-20692 10-70)
Avail: NTIS HC A09/MF A01 CSCL 20/6

N83-20695# SRI International Corp., Menlo Park, Calif.
STEREOPSIS HAS THE EDGE IN 3-D DISPLAYS
Thomas P. Piantanida *In* NAS-NRC Three-Dimensional Displays 1982 p 55-84 refs (For primary document see N83-20692 10-70)
Avail: NTIS HC A09/MF A01 CSCL 20/6

N83-20696# Michigan Univ., Ann Arbor. Perception Lab.
DOT AND LINE DETECTION IN STEREOSCOPIC SPACE
William R. Uttal, Mark Azzato, and John Brogan *In* NAS-NRC Three-Dimensional Displays 1982 p 85-126 refs (For primary document see N83-20692 10-70)
Avail: NTIS HC A09/MF A01 CSCL 20/6

N83-20698# Louisville Univ., Ky. Performance Research Lab.
A STEREO-RANGEFINDER EXPERIENCE
George S. Harker *In* NAS-NRC Three-Dimensional Displays 1982 p 139-144 refs (For primary document see N83-20692 10-70)
Avail: NTIS HC A09/MF A01 CSCL 20/6

N83-20699# Perceptronics, Inc., Woodland Hills, Calif.
ISSUES IN THE EVALUATION OF 3-D DISPLAY APPLICATIONS
John O. Merrit *In* NAS-NRC Three-Dimensional Displays 1982 p 145-149 refs (For primary document see N83-20692 10-70)
Avail: NTIS HC A09/MF A01 CSCL 20/6

N83-20700# Naval Ocean Systems Center, Kailua, Hawaii.
VISUAL PERCEPTION RESEARCH AT NAVAL OCEAN SYSTEMS CENTER
Ross L. Pepper *In* NAS-NRC Three-Dimensional Displays 1982 p 151-154 (For primary document see N83-20692 10-70)
Avail: NTIS HC A09/MF A01 CSCL 20/6

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N83-20778# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROBLEMS RELATED TO PLASMA IN HIGH SPEED FLIGHT
Wu Chengkang 27 Oct. 1982 25 p Transl. into ENGLISH from Lixue Yushijian (China), v. 3, no. 1, 1981 p 2-7, 18
(AD-A122013; FTD-ID(RS)T-0780-82) Avail: NTIS HC A02/MF A01 CSCL 20/9

Problems related to plasma in high speed flight such as those occurring in guided missiles and Earth satellites are described. Emphasis is given to: the high temperature heat transfer of plasma, the effects of the plasma sheath on electromagnetic waves, and the high specific electric propulsion method. L.F.M.

N83-20779# California Univ., Los Angeles. Dept. of Physics.
COLD WAVEGUIDE ELECTROSTATIC MODES BETWEEN UPPER HYBRID AND PLASMA RESONANCE
G. J. Morales and J. E. Maggs Jul. 1982 23 p refs
(Contract N00014-75-C-0476)
(AD-A121785; PPG-640) Avail: NTIS HC A02/MF A01 CSCL 20/3

The structure of electrostatic oscillations is determined for a cold plasma with a zero order density gradient along the magnetic field. A set of well-behaved structures, bounded at plasma resonance, exists for discrete values of perpendicular wavenumber. Under these conditions the plasma acts as a waveguide. A Green's function suitable for sources located in the overdense region of the plasma is constructed from these waveguide-like solutions. Author (GRA)

N83-20780# Naval Research Lab., Washington, D. C. Center for Space Research.
ON THE EXTRAPOLATION OF SPACE-SIMULATION BEAM-PLASMA INVESTIGATIONS TO SHUTTLE-BORNE APPLICATIONS Interim Report
E. P. Szuszczewicz 9 Nov. 1982 22 p refs
(RR0330244)
(AD-A121696; AD-E000507; NRL-MR-4941) Avail: NTIS HC A02/MF A01 CSCL 20/9

Laboratory simulations of space plasma phenomena provide an important link in establishing broader perspectives of various plasma processes, in helping to understand spatially or temporally limited rocket and satellite observations, and in planning future spaceborne experiments. One such area has been the artificial injection of energetic electron beams in space which has transitioned from an early and somewhat confused set of rocket data through a relatively intensive program of laboratory based space simulations, to an ambitious program which exploits the Shuttle as a readily accessible laboratory in space. While accumulated information points to a considerably improved understanding of beam plasma parameters which define single particle behavior on the one hand and collective beam plasma properties on the other, the extrapolation of these results to Shuttle borne applications is met with a number of constraints. Focusing on the transition from single particle behavior to the collective nonlinear interactions in the beam plasma discharge, this paper provides a comparative analysis on aspects involving Shuttle unique environmental effects. Emphasis is placed on Shuttle potentials and associated sheaths, ambient plasma and neutral density effects including relative spacecraft motion, pulsed versus dc gun operation, and beam plasma discharge criteria in general. GRA

N83-20781# Artec Associates, Inc., Hayward, Calif.
HIGH POWER PULSED PLASMA MHD EXPERIMENTS Annual Report, 1 Jan. 1981 - 30 Sep. 1982
D. W. Baum, S. P. Gill, W. L. Shimmin, and J. D. Watson 30 Sep. 1982 47 p refs
(Contract N00014-81-C-0045)
(AD-A120526; AR-165) Avail: NTIS HC A03/MF A01 CSCL 20/9

Results of high power pulsed plasma MHD experiments are reported. An explosively driven plasma source is used to drive a Faraday mode MHD generator with an externally applied B-field of several tesla. The highest power achieved was 6 gigawatts in a 140 kJ electrical pulse delivered to a resistive load. The experimentally observed scaling relationships of power with applied B-field and electrode area are also presented. GRA

N83-20782# Artec Associates, Inc., Hayward, Calif.
HIGH POWER PULSED PLASMA MHD EXPERIMENTS Annual Report, 1 Jan. 1981 - 30 Sep. 1982
D. W. Baum, S. P. Gill, W. L. Shimmin, and J. D. Watson 20 Sep. 1982 48 p refs
(Contract N00014-81-C-0045)
(AD-A120526; AR-165) Avail: NTIS HC A03/MF A01 CSCL 20/9

Results of high power pulsed plasma MHD experiments are reported. An explosively driven plasma source is used to drive a Faraday mode MHD generator with an externally applied B-field of several tesla. The highest power achieved was 6 gigawatts in a 140 kJ electrical pulse delivered to a resistive load. The experimentally observed scaling relationships of power with applied B-field and electrode area are also presented. Author (GRA)

N83-20783# Naval Research Lab., Washington, D. C.
INERTIAL-CONFINEMENT-FUSION THEORY Annual Report, 1 Oct. 1980 - 30 Sep. 1981
I. Haber May 1982 42 p refs
(Contract DE-AI08-79DP-40092)
(DE83-002873; DOE/DP-40092/1) Avail: NTIS HC A03/MF A01

The ultimate use of computer simulations to aid in accelerator design and interpretation of experimental results was investigated. Progress is made in the employment of simplified models to understand the scaling of the relevant physics and to conduct simulations specific to those problems which can be examined by less than a full three dimensional model. Transverse simulations were performed to further refine the understanding of the transport of intense beams in an alternate gradient channel and to determine, for a test case, the importance of space charge aberrations on a final focusing system. The numerical limitations of a longitudinal simulation model was determined. This longitudinal code is also used to investigate both the fundamental scaling of the beam dynamics and the nonlinear propagation and growth of a perturbation on a bunched beam in the presence of wall impedances approximating those expected in various accelerator systems. DOE

N83-20784# Los Alamos Scientific Lab., N. Mex.
HIGH-ENERGY ELECTRON GENERATION AND TRANSPORT IN CO2-LASER-HEATED PLASMAS
Damon V. Giovanielli 1982 24 p refs Presented at the US/Japan Seminar on Theory and Appl. of Multiple Ionized Plasmas Produced by Laser and Particle Beams, Nara, Japan, 3-7 May 1982
(DE82-011991; LA-UR-82-734; CONF-820528-2) Avail: NTIS HC A02/MF A01

The feasibility of burning (fusing) a large fraction of a small mass (less than 1 mg) of DT fuel was examined. Emphasis is placed on examining the physics of CO2-laser-irradiated targets. In addition, projects are continuing in the development of other lasers and heavy ion accelerators, and relativistic electron beam plasma heating, as possible alternate drivers. The objective is to provide the necessary useful energy to a fusion capsule (0.2 to 2 MJ) at the lowest cost. A review of the Los Alamos program is given. DOE

N83-20785# California Univ., Livermore. Lawrence Livermore Lab.
HEAVY-ION INERTIAL FUSION: INFLUENCE OF TARGET GAIN ON ACCELERATOR PARAMETERS FOR VACUUM-PROPAGATION REGIMES IN REACTION CHAMBERS
James W-K. Mark, R. O. Bangerter, W. A. Barletta, W. M. Fawley, and D. L. Judd 4 Mar. 1982 32 p refs Presented at the Symp. on Accelerator Aspects of Ion Fusion, Darmstadt, West Germany, 29 Mar. 1982
(Contract W-7405-eng-48)
(DE82-012784; UCRL-87377; CONF-820338-4) Avail: NTIS HC A03/MF A01

Target physics imposes requirements on the design of inertial fusion drivers. The influence of beam propagation in near vacuum fusion reaction chambers is evaluated for the relation between target gain and the phase space requirements of heavy ion accelerators. Initial results suggest that neutralization of the ion beam has a much greater positive effect than the deleterious one of beam stripping provided that the fusion chamber pressure is < 0.0010 torr (of Li vapor or equivalent). DOE

N83-20786# California Univ., Livermore. Lawrence Livermore Lab.
LASER-PLASMA INSTABILITIES IN LARGE PLASMAS IRRADIATED AT 1.06 MICRON AND THE WAVELENGTH SCALING OF THE ABSORPTION, HOT-ELECTRON PRODUCTION, ABLATION PRESSURE FOR 1.06-, 0.53-, MICRON LIGHT
D. W. Phillion, E. M. Campbell, R. E. Turner, F. Ze, K. G. Estabrook, B. F. Lasinski, W. L. Mead, C. E. Max, G. E. Phillips, and N. C. Holmes 1982 36 p Presented at the Intern. Conf. on Plasma Phys., Goteborg, Sweden, 7 Jun. 1982
(Contract W-7405-eng-48)
(DE82-016785; UCRL-87720; CONF-820618-5) Avail: NTIS HC A03/MF A01

Plasmas were created by exploding 7000 A thick CH foils at the irradiation conditions: 1.064 microns, 3 kJ, 2.5 x 10 to the fifteenth power W sq cm, 900 ps FWHM, 400 microns spot diameter. Ten percent of the laser energy appeared as Raman light and 0.04% as 3 omega sub zero/2 light. The 3 omega sub zero/2 light and the 30 to 70 keV X-rays occurred simultaneously at t = -120 to the fiftieth power/sub -/200 psec and lasted only 300 psec FWHM. The foil was calculated to explode to n/sub c/4 at t = -300 psec. The spectrum and angular distribution of the Raman light were also measured. Time resolved spectral measurements have been made in experiments with 5320 A laser light in a 600 to 900 psec FWHM pulse. The scaling of the 3 omega sub zero/2 light with both the laser spot size and pulse length has been studied. DOE

N83-20787# Science Applications, Inc., Boulder, Colo. Plasma Research Inst.
SELF-CONSISTENT AXIAL AMBIPOLAR POTENTIAL PROFILE IN MIRROR MACHINES
B. Hafizi and K. T. Tsang Nov. 1982 29 p refs
(Contract DE-AC03-76ET-53057)
(DE83-003336; SAI-254-82-318-LJ; PRI-56) Avail: NTIS HC A03/MF A01

An iterative numerical scheme was developed to self consistently evaluate the axial ambipolar potential profile in a mirror machine. The contribution to the ion density due to the profile trapping effect (or Yushmanov effect) was carefully kept. Two cases were studied: (1) a simple mirror with Maxwellian ions and electrons, and (2) a simple mirror with sloshing ions. In case (1) the profile trapping effect is not significant. However, in case (2) profile trapping enhances significantly the potential peaking due to the sloshing ions. DOE

N83-20788# McDonnell-Douglas Corp., St. Louis, Mo.
ELMO BUMPY TORUS PROOF OF PRINCIPLE, PHASE 2: TITLE 1 REPORT. VOLUME 2: TOROIDAL VESSEL
J. L. Conlee 26 Feb. 1982 133 p refs
(Contract W-7405-eng-26)
(DE83-001505; ORNL/Sub-81-21099/1-02) Avail: NTIS HC A07/MF A01

The Toroidal Vessel which provides the vacuum enclosure for containing the high temperature steady state plasma was studied. The Toroidal Vessel must provide several viewing ports for plasma diagnostics, vacuum pumping ports for both high vacuum and roughing vacuum, feed through ports for ECRH waveguides, limiter feed throughs for cooling and supporting the limiters, and ports for ion gages. The vessel operates in an intense environment comprised of X-rays, microwaves, magnetic fields and plasma heat loads as well as the atmosphere pressure and gravity loads and the internal thermal stress loads due to heating and cooling of the torus. The choice of vacuum vessel seal and wall materials was addressed. During the course of the study, it was requested that horsecollar diagnostic ports be incorporated in the design. The vessel material issues in concert with the impact of the horsecollar port design was studied. A change in baseline from an aluminum vessel with elastomer seals and circular diagnostic ports to austenitic stainless steel vessel with metal seals and horsecollar ports is agreed upon. DOE

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N83-20789* National Aeronautics and Space Administration. Pasadena Office, Calif.
CONTROLLED IN SITU ETCH-BACK Patent
Robert J. Mattauch (JPL, California Inst. of Tech., Pasadena) and

Alan C. Seabaugh, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 20 Nov. 1981 5 p Filed 30 Nov. 1981 Supersedes N82-25995 (20 - 16, p 2312) Sponsored by NASA (NASA-Case-NPO-15625-1; US-Patent-4,373,989; US-Patent-Appl-SN-325933; US-Patent-Class-156-635; US-Patent-Class-148-173; US-Patent-Class-148-175; US-Patent-Class-156-608; US-Patent-Class-156-624; US-Patent-Class-156-654; US-Patent-Class-156-662) Avail: US Patent and Trademark Office CSCL 20B

A controlled in situ etch-back technique is disclosed in which an etch melt and a growth melt are first saturated by a source-seed crystal and thereafter etch-back of a substrate takes place by the slightly undersaturated etch melt, followed by LPE growth of a layer by the growth melt, which is slightly supersaturated.

Official Gazette of the U.S. Patent and Trademark Office

N83-20790*# Teledyne Brown Engineering, Huntsville, Ala. Space Systems Dept.

FEASIBILTY ANALYSES OF ELECTROEPITAXIAL RESEARCH AND DEVELOPMENT ACCOMODATIONS. VOLUME 1: ACCOMMODATIONS ASSESSMENT Summary Report

23 Mar. 1983 103 p refs

(Contract NAS8-34743)

(NASA-CR-170727; NAS 1.26:170727; SP82-MSFC-2591-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 20L

A preliminary assessment of the feasibility of accommodating the on-orbit R&D requirements for electroepitaxial crystal growth using the Orbiter middeck, the Materials Experiment Assembly or the Get-Away Special cans was performed. The study is based on the proposed electroepitaxial growth of single crystals of gallium arsenide (GaAs). Baseline R&D requirements, synthesizing furnace and facility conceptual design requirements, accommodation requirements, preliminary compatibility assessments are established. The systems engineering approach employed for the individual assessments is outlined. S.L.

N83-20791*# Teledyne Brown Engineering, Huntsville, Ala. Space Systems Dept.

FEASIBILTY ANALYSES OF ELECTROEPITAXIAL RESEARCH AND DEVELOPMENT ACCOMMODATIONS. VOLUMN 2: ELECTROEPITAXIAL GROWTH OF GaAs Summary Report

Apr. 1982 23 p refs

(NASA-CR-170728; NAS 1.26:170728; SP82-MSFC-2591-Vol-2) Avail: NTIS HC A02/MF A01 CSCL 20L

The technique of electromigration, i.e., electric field induced forced convection, can be used to grow semiconductor material and other compounds from solution by passing electric current through the growth interface while the temperature of the system is maintained constant. Current controlled electromigration, referred to as electroepitaxy, was successfully applied to grow epitaxial layers of various semiconductors and garnets. S.L.

N83-20792# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering.

HOT-ELECTRON INJECTION INTO GaAs AND RELATED MATERIALS Final Report

David Adler 5 Oct. 1982 15 p refs

(Grant DAAG29-78-G-0035)

(AD-A120941; ARO-14813.7-PH) Avail: NTIS HC A02/MF A01 CSCL 09/1

A wide array of phenomena involving chalcogenide glasses, amorphous silicon alloys, and III-V semiconductors were investigated. Chalcogenide glass/GaAs heterojunctions, finding an accumulation region near the anode of the GaAs which pins the field below threshold in forward bias were studied; in reverse bias, a depletion region is induced near the cathode of the GaAs. Similar results were found for InP heterojunctions. A model was developed for threshold switching in chalcogenides, including the mechanism for the switching and recovery events and the nature of the ON-state. A narrow band electroluminescence was detected at room temperature during the pulsed ON-state, and evidence for its coherence was found. Thin film transistors were fabricated using a chalcogenide glass as the active material resulted in a microfilm product of approximately 2 sq cm/V-s, more than a factor of 10 to the 6th power greater than those previously reported. The field effect was found to be transient and a detailed model was developed. The effect is controlled by a potential barrier which retards neutral defect interconversion. Similar results were invoked to explain the Staebler-Wronski effect in amorphous silicon alloys and fatigue in MNOS transistors. Switching in amorphous silicon alloys was investigated. Author (GRA)

N83-20793# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.

GROWTH OF InP BY MOLECULAR BEAM EPITAXY Final Report, 1 Nov. 1980 - 28 Feb. 1982

Earl L. Meeks and Fred L. Eisele 28 Feb. 1982 25 p refs

(Contract DAAG29-80-K-0100)

(AD-A120876; ARO-17919.1-EL-A) Avail: NTIS HC A02/MF A01 CSCL 20/7

Indium Phosphide MBE layers have been grown using a number of different phosphorus sources. Sources that produce a significant flux of P2 or atomic phosphorus yield much higher quality epitaxial films than sources which are predominantly P4. The best materials grown to date had room temperature mobilities greater than 3700 sq cm/V-s-I and were grown using a small Inp phosphorus source. The geometry of the Inp phosphorus source is important. An incorrect choice can produce a source that produces predominately the P4 molecular species rather than the desired P2.

Author (GRA)

N83-20794# Hughes Research Labs., Malibu, Calif.

ADVANCED SILICON MATERIAL DEVELOPMENT FOR LADIR Final Report, 15 Aug. 1978 - 1 Sep. 1981

H. Kimura, M. H. Young, G. D. Robertson, and O. J. Marsh Wright-Patterson AFB, Ohio AFWAL Dec. 1981 147 p

(Contract F33615-78-C-5062; AF Proj. 2423)

(AD-A120980; AFWAL-TR-81-4021) Avail: NTIS HC A07/MF A01 CSCL 17/5

Results from several float-zoned <100> Si:Ga crystals show that the uniformity of Ga distribution improves as the growth rate is decreased and the rotation rate during growth is increased, in agreement with diffusion theory. For 2-in. diameter crystals, the lowest growth rate that will yield dislocation-free crystals in our equipment is about 3 mm/min. The onset of mechanical resonance and vibration of the growing crystal supported on its slender seed crystal limits the rotation rate of about 10 rpm. Crystals grown under these conditions, and later neutron transmutation counter-doped, show very good spatial uniformity of both major and compensating dopants. Thermal diffusion studies showed that annealing at 1300 C for several hundred hours also reduced Ga concentration fluctuations. Longitudinal detectors were fabricated from processed FPA wafers covering a Ga concentration range from 0.2 to 2 x 10 to the 17th power Ga atoms/cu cm. Experimentally determined quantum efficiency and D* for these detectors agreed very well with theoretical predictions based on a model developed by Baron and Szmulowicz. The value of this model to future FLIR system design is now firmly established. GRA

N83-20795# California Univ., San Diego, La Jolla. Dept. of Physics.

THEORETICAL PROBLEMS OF THE SOLID STATE Final Report, 1 Aug. 1975 - 30 Apr. 1982

W. Kohn Nov. 1982 8 p refs

(Contract N00014-76-C-0050)

(AD-A121415) Avail: NTIS HC A02/MF A01 CSCL 20/8

A universal model for surface energies; position scattering from surfaces; narrowing of hole bands of valence electron scattering; dynamics response of inhomogeneous ferminon systems; and valence fluctuation compounds are discussed. GRA

N83-20796# Brown Univ., Providence, R. I. Dept. of Chemistry.

PREPARATION AND PROPERTIES OF SUBSTITUTED IRON TUNGSTATES

K. Sieber, H. Leiva, K. Kourtakis, R. Kershaw, and K. Dwight 17 Nov. 1982 24 p refs

(Contract N00014-77-C-0387)
(AD-A121699; TR-23) Avail: NTIS HC A02/MF A01 CSCL 20/12

FeWO6 is an n-type semiconductor crystallizing with the tri-alpha-PbO2 structure, an ordered variant of the more basic alpha -PbO2 structure. The extrinsic semiconducting behavior is consistent with the presence of both iron(II) and iron(III) in the puckered chains of the structure. The presence of the two valence states of iron is due to a solid solution of a small amount of FeWO4 in Fe2WO6. Substitution of chromium(III) into Fe2WO6 changes the structure type to inverse trirutile, and it is found that chromium(III) effectively blocks any electron hopping between iron(II) and iron(III) in this structure. FeWO4, on the other hand, is a p-type semiconductor crystallizing with the wolframite structure. The extrinsic semiconducting behavior of FeWO4 is consistent with the presence of both iron(II) and iron(III) in the puckered chains produced by solid solution with a small amount of FeWO6. Substitution of manganese(II) into FeWO4 mainitains the wolframite structure; however, the room temperature resistivity does not vary as markedly as anticipated for electron hopping between iron(II) and iron(III) along the puckered chains. This suggests that contributions to the electrical conductivity may occur by interchain electron transfer via (WO6) octahedra in the FeWO4 structure.
GRA

N83-20797# Varian Associates, Palo Alto, Calif.
RESEARCH ON MOLECULAR BEAM EPITAXY Final Scientific Report, 1 May 1981 - 30 Apr. 1982
Y. G. Chai and R. Chow May 1982 52 p refs
(Contract F49620-81-C-0068; AF Proj. 2305)
(AD-A122209; AFOSR-82-1033TR) Avail: NTIS HC A04/MF A01 CSCL 20/2

Thermodynamic calculations show that phosphine should thermally dissociate into the phosphorus dimer to a high degree. Three furnaces were constructed to study the cracking of phosphine. Phosphine was found to react with tantalum, but not to any great extent with quartz. Cracking efficiencies greater than 90% were obtained with the furnace using a quartz cartridge filled with matted quartz. Molecular beam epitaxial layers of InP were grown on Cr-doped, (100)-oriented InP substrates using the quartz cartridge furnace. The 77 deg K photoluminescence spectra were comparable to other MBE InP using other types of phosphorus sources. Carrier mobility and concentrations at 77 deg K and 300 deg K were measured. GRA

N83-20798# Philips Labs., Briarcliff Manor, New York.
CRYSTAL GROWTH OF: YTTRIUM PHOSPHATE Ce3+, THORIUM DIOXIDE AND Ce3+, LANTHANUM ALUMINATE Final Report, 15 Feb. 1979 - 5 Apr. 1982
W. Zwicker, S. Colak, J. Khurgin, E. Abelaf, and T. Kovats Oct. 1982 29 p refs
(Contract N00014-79-C-0180)
(AD-A122328) Avail: NTIS HC A03/MF A01 CSCL 20/2

Single crystals of YPO4 were grown from various types of fluxes, and their potential as polarizers in high power lasers was investigated. Although the crystals showed high resistance to damage by laser radiation, they were of poor quality due to cracks and flux inclusions. Crystals of Ce-doped ThO2 and LaAlO3 were grown by fluxed melt techniques using fluxes of various compositions. Standard absorption and luminescence techniques were used to evaluate the potential of these Ce-doped crystals for a solid state laser emitting in the blue-green region of the spectrum. No visible luminescence was observed from the crystals. GRA

N83-20799# Washington Univ., St. Louis, Mo. Semiconductor Research Lab.
IMPURITY AND DEFECT INTERACTIONS IN GaAs Annual Technical Report, 1 Aug. 1981 - 31 Jul. 1982
C. M. Wolfe, P. A. Fedders, G. E. Stillman, Camellia M. L. Yee, R. T. Green, T. S. Low, and B. J. Skromme 30 Sep. 1982 216 p refs
(Contract N00014-80-C-0762; RR0210203)
(AD-A122217; WU/SRL-64422-10) Avail: NTIS HC A10/MF A01 CSCL 20/2

Research conducted by the Washington University Semiconductor Research Laboratory is reported. The research activities include: photoconductivity spectra for hydrogenic donor complexes, coulomb fluctuations from non-random donor distributions, piezoelectric strain scattering from neutral impurities, Cr complexes and bulk redistribution during diffusion and annealing, Cr surface redistribution during annealing, charged impurity redistribution during epitaxial growth, incorporation of amphoteric impurities, identification of Si donors, residual donors in molecular beam epitaxy, and multiple doping experiments. L.F.M.

N83-20800# Washington Univ., St. Louis, Mo. Dept. of Electrical Engineering.
IMPURITY REDISTRIBUTION DURING EPITAXY AND A MODEL OF Cr IN GaAs
H. Rohdin, M. W. Muller, and C. M. Wolfe Sep. 1982 150 p refs
(Contract N00014-79-C-0840)
(AD-A122216; TR-ONR-82-5) Avail: NTIS HC A07/MF A01 CSCL 20/2

This report presents a model of impurity redistribution during epitaxial growth of semiconductors due to diffusion, drift in the built-in electric field, and the growth itself. Examples show unexpected impurity profiles for the minority dopants, and indicate how undesirable conductivity regions can occur. The numerical techniques used, including iterative quasilinearization of the Shockley-Poisson equation for arbitrary doping, and dynamically adjusted time increment and mesh distances, are described. A model of Cr in GaAs, consistent with a large body of experimental data, is presented. Mechanisms explaining compensation and redistribution are proposed and estimates of some material parameters are given. Author (GRA)

N83-20801# Lincoln Lab., Mass. Inst. of Tech., Lexington. Solid State Research Div.
SOLID STATE RESEARCH Quarterly Technical Summary Report, 1 Feb. - 30 Apr. 1982
Alan L. McWhorter 15 May 1982 122 p refs
(Contract F19628-80-C-0002; AF Proj. 649L)
(AD-A122252; ESD-TR-82-055; Rept-1982-2) Avail: NTIS HC A06/MF A01 CSCL 20/12

This report covers in detail the solid state research work of the Solid State Division at Lincoln Laboratory for the period 1 February through 30 April 1982. The topics covered are solid state device research, quantum electronics, materials research, microelectronics, and analog device technology. Funding is primarily provided by the Air Force, with additional support provided by the Army, DARPA, Navy, NASA, and DOE. GRA

N83-20802# Brown Univ., Providence, R. I. Materials Research Lab.
INTERDISCIPLINARY RESEARCH COVERING PLASTICITY OF SOLIDS, FRACTURE OF SOLIDS, INORGANIC GLASSES, AND LOWER DIMENSIONALITY MATERIALS AND STRUCTURES Annual Technical Report, 1 Jul. 1980 - 30 Jun. 1981
R. J. Asaro, D. H. Avery, P. J. Bray, K. B. Broberg, and R. J. Clifton 30 Jun. 1981 74 p refs
(Grant NSF DMR-79-23257)
(AD-A113883) Avail: NTIS HC A04/MF A01 CSCL 20/12

Research conducted by the Brown University Materials Research Laboratory is reported. Research activities included: plasticity of solids, fracture of solids, inorganic glasses, lower dimensionality materials and structures, solid surfaces, properties of materials at low temperatures, and materials for solar energy conversion. L.F.M.

N83-20803# Cornell Univ., Ithaca, N. Y.
MECHANICAL PROPERTIES OF CRYSTALLINE SOLIDS Progress Report, 1 Mar. 1981 - 29 Feb. 1983
Che-Yu Li and S. Mukherjee 1983 76 p refs
(Contract DE-AC02-82ER-12038)
(DE83-003292; DOE/ER-12038/7) Avail: NTIS HC A05/MF A01

The work hardening properties of copper were investigated to test a state variable relation. In the analysis of stress dip data it was demonstrated that under appropriate conditions, the stress dip data are equivalent to the load relaxation data. In the area of grain boundary sliding and superplasticity, it was established experimentally that the value of a stress reduction factor is in agreement with the calculated value based on several recent theories on grain boundary sliding. A correlation was found between the stress-to-rupture data and the load relaxation data of 2.25 Cr-1 Mo steels which potentially can be used for data correlation and extrapolation. A finite element computer program was developed and applied to metal extrusion problems. GRA

N83-20804# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
KRYPTON RETENTION ON SOLID ADSORBENTS
P. R. Monson, Jr. Jan. 1982 52 p refs
(Contract DE-AC09-76SR-00001)
(DE82-012755; DP-1615) Avail: NTIS HC A04/MF A01

Economical solid adsorbents were developed for the retention of krypton from a dissolver off-gas stream. A solid adsorbent system is feasible and competitive with other developing systems which utilize fluorocarbon adsorption and cryogenic distillation. This technology may have potential applications not only in nuclear fuel reprocessing plants, but in nuclear reactors and in environmental monitoring. Of the 13 prospective adsorbents evaluated with respect to adsorption capacity and cost, the commercially available hydrogen mordenite was the most cost-effective material at subambient temperatures (-40 to -80 C). Silver mordenite has a higher capacity for krypton retention, but is 50 times more expensive than hydrogen mordenite. DOE

N83-20805# Cornell Univ., Ithaca, N. Y. Dept. of Materials Science and Engineering.
INFLUENCE OF GRAIN BOUNDARIES ON THE ELECTRICAL PROPERTIES OF POLYCRYSTALLINE-SILICON FILMS Progress Report
D. G. Ast Dec. 1981 102 p refs
(Contract DE-AS02-76ER-02899)
(DE82-007833; DOE/ER-02899/5) Avail: NTIS HC A06/MF A01

Progress is reported in: preparation of TEM specimens and Schottky diodes for EBIC investigations; acquisition and installation of instruments for EBIC, SEM, and DLTS; the discovery that certain grain boundaries in silicon are actually dissociated on a extremely fine scale; and the EBIC contrast analysis of atomic jogs in intrinsic grain boundary dislocations in a SIGMA-3 grain boundary. The structure and electrical properties of silicon are studied. DOE

N83-20806# National Bureau of Standards, Washington, D.C.
DEVELOPMENT OF STANDARDS FOR SUPERCONDUCTORS Interim Report, Oct. 1980 - Jan. 1982
A. F. Clark, L. F. Goodrich, F. R. Fickett, and J. V. Minervini Jul. 1982 120 p refs Sponsored in part by MIT
(Contract DE-AC01-76PR-06010)
(PB83-110296; NBSIR-82-1678) Avail: NTIS HC A06/MF A01 CSCL 20L

Standard measurement practices for use in large scale applications of superconductivity were developed. The goal is the adoption of voluntary standards for the critical parameters and other characterizations of practical superconductors. The major effort was the development of a standard test method for critical current, the necessary back-up research, and the coordination of the adoption of the test method and a standard terminology. GRA

N83-20807# Brown Univ., Providence, R. I. Dept. of Physics.
DEVELOPMENT OF SOLID STATE INFRARED EMITTERS FOR DETECTION APPLICATIONS Annual Report, Jun. 1981 - May 1982
Hendrik J. Gerritsen, Everett E. Crisman, and James T. Daly Jun. 1982 41 p refs Sponsored by Gas Research Inst.
(PB83-102368; GRI-82/0018) Avail: NTIS HC A03/MF A01 CSCL 14B

Ternary InAs(1-y)Sb(y) was grown on InAs (111B) substrates in the composition range 0.05 less than or equal to y less than or equal to 0.12 by the steady-state liquid phase epitaxial technique. Layer compositions measured with the electron microprobe agree well with predictions based on the calculated phase diagram. Photoluminescence measurements on InAs(0.92)Sb(0.08) at 77 K show a shift in emission wavelength which at 300 K will correspond to the 4.2 micrometer absorption maximum of carbon dioxide. GRA

N83-20857*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE IONIZATION STATE IN A GAS WITH A NON-MAXWELLIAN ELECTRON DISTRIBUTION
S. P. Owocki and J. D. Scudder *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 107-112 refs Prepared in cooperation with the High Altitude Observatory (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 20L

N83-20240# Centre National d'Etudes des Telecommunications, Lannion (France).
FAILURE MECHANISMS IN HELICAL NEMATIC LIQUID CRYSTALS: PRELIMINARY INVESTIGATIONS [MECANISMES DE DEFAILLANCE DANS LES CELLULES A CRISTAUX LIQUIDS NEMATIQUES EN HELICE: ETUDES PRELIMAIRES]
G. Bouvy *In* ESA Reliability and Maintainability Sep. 1982 p 449-457 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20247# Centre National d'Etudes Spatiales, Toulouse (France).
SIMULATION OF THE EFFECTS OF COSMIC RADIATION ON RAM'S IN CMOS TECHNOLOGY [SIMULATION DES EFFETS DU RAYONNEMENT COSMIQUE SUR LES MEMOIRES RAM EN TECHNOLOGIE C/MOS]
A. Baiget, A. Labarthe, R. Bimbot (Inst. de Physique Nucleaire, Orsay, France), and S. Bela-Negra *In* ESA Reliability and Maintainability Sep. 1982 p 497-504 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20261# Centre National d'Etudes des Telecommunications, Lannion (France).
CHARACTERIZATION METHOD FOR LIQUID CRYSTAL DISPLAYS: RELIABILITY APPROACH [METHODES DE CARACTERISATION DES AFFICHEURS A CRISTAUX LIQUIDES: APPROCHE DE FIABILITE]
J. P. Boulet, J. Glasser, F. Chatton, G. Michaud, and H. Prigent *In* ESA Reliability and Maintainability Sep. 1982 p 589-595 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N83-20808*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A SEARCH FOR EQUILIBRIUM STATES
Frank J. Zeleznik Nov. 1982 13 p refs Presented at Calphad 11, Argonne, Ill., 16-20 May 1982
(NASA-TM-82898; E-1281; NAS 1.15:82898) Avail: NTIS HC A02/MF A01 CSCL 20M

An efficient search algorithm is described for the location of equilibrium states in a search set of states which differ from one

another only by the choice of pure phases. The algorithm has three important characteristics: (1) it ignores states which have little prospect for being an improved approximation to the true equilibrium state; (2) it avoids states which lead to singular iteration equations; (3) it furnishes a search history which can provide clues to alternative search paths. Author

N83-20809# Oak Ridge National Lab., Tenn. Energy Div.
COMBINED HEAT AND MASS TRANSFER IN ABSORPTION PROCESSES
Gershon Grossman 1982 4 p Presented at the Intern. Workshop on Absorption Working Fluids R and D., Berlin, 14 - 17 Apr. 1982
(Contract W-7405-eng-26)
(DE82-013436; CONF-820452-1) Avail: NTIS HC A02/MF A01

The approach to theoretical analysis of the combined heat and mass transfer process taking place in absorption systems is described. The two transfer phenomena are strongly coupled here. The purpose of the analysis is to relate, quantitatively, the heat and mass transfer coefficients to the physical properties of the working fluids and to the geometry of the system. The preferred configuration is that of a falling film of liquid on a metallic surface which serves to transfer heat from the absorbent in contact with the vapor of the absorbate. The model developed may be solved for laminar, turbulent, or transition flow regimes. The results of the solution describe the development of the thermal and concentration boundary layers and the variation of the temperatures, concentration, and heat and mass fluxes. These quantities in their normalized, dimensionless form depend on two characteristic parameters of the system: the Lewis number Le and the dimensionless heat of absorption lambda. The length in the direction of flow is normalized with respect to the Peclet number and the film thickness. Heat and mass transfer coefficients for the system were calculated. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N83-20810*# National Aeronautics and Space Administration, Washington, D. C.
FISCAL YEAR 1983 RESEARCH AND TECHNOLOGY PROGRAM
[1982] 142 p
(NASA-TM-84840; NAS 1.15:84840) Avail: NTIS HC A03/MF A01 CSCL 05A

A compilation of summary portions of each of the Research and Technology Operating Plans (RTOPS) used for management review and control of research currently in progress throughout NASA is presented. Subject, technical monitor, responsible NASA organization, and RTOP number indexes are included. B.G.

N83-20811# Naval Postgraduate School, Monterey, Calif. Dept. of Computer Science.
DESIGN AND IMPLEMENTATION OF A PERSONAL DATABASE MANAGEMENT SYSTEM M.S. Thesis
Peter L. Jones Jun. 1982 116 p refs
(AD-A121894) Avail: NTIS HC A06/MF A01 CSCL 09/2

The Personal Database Management System is a hardware and software system designed to support people's memory and recall processes. It is a small, low power, and inexpensive microcomputer system which employs EEPROM and CMOS technology. The design is based upon how people manage their personal information, which was found to be different from the ways conventional computerized systems manage information. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N83-20812# Comptroller General of the United States, Washington, D.C.
GREATER EMPHASIS ON INFORMATION RESOURCE MANAGEMENT IS NEEDED AT THE FEDERAL AVIATION ADMINISTRATION
24 Nov. 1982 71 p
(GAO/RCED-83-60) Avail: NTIS HC A04/MF A01

Centralization of FAA management of information resources is recommended. Development of a DOT computer capacity and workload management program is also recommended. Author

N83-20813# RAND Corp., Santa Monica, Calif.
INFORMATION POLICY: THOUGHTS FOR THE 80'S
Willis H. Ware Aug. 1982 9 p Presented at the NTIA Conf. on Future Directions in Inform. Policy, Wash., D.C., 24 May 1982
(RAND/P-6798) Avail: NTIS HC A02/MF A01

Policy issues conerning the convergence of computed and telecommunications are discussed. N.W.

N83-20814*# Alabama Univ., Huntsville. Dept. of Physics.
ASSESSMENT OF THE SOLAR-TERRESTRIAL DATA BASE MANAGEMENT SYSTEM Final Technical Report
James L. Horwitz Feb. 1983 5 p refs
(Contract NAS8-34534)
(NASA-CR-170726; NAS 1.26:170726) Avail: NTIS HC A02/MF A01 CSCL 05B

Members of the space science community used the present MSFC NEEDS network. The design and development of improvements and extension of the NEEDS network were designed and development of improvements and extension of the NEEDS network were discussed. Author

N83-20815# Boeing Military Airplane Development, Seattle, Wash.
MIL-STD-1553 MULTIPLEX DATA BUS WORD FORMATS Final Report, Nov. 1980 - Dec. 1981
Dec. 1981 112 p Revised
(Contract F33615-80-C-0124)
(AD-A121934) Avail: NTIS HC A06/MF A01 CSCL 09/2

The emphasis in this chapter is the development of data word and message formats for MIL-STS-1553 data bus applications. This chapter is intended as a guide to the designer to identify standard data words and messages that are being used in today's avionic systems and subsystems. These standard words and messages, as well as the documentation format for interface control document (ICD) sheets, provide the basis for defining new 1553 systems. The standards defined in this chapter have met the test of application usage across several 1553 systems and thus provide the acceptable method for transmitting signals of this type in a 1553 system. Also provided in this chapter is the method for developing additional data word formats and messages that may be required by a particular system but are not covered by the standards provided herein. It is essential that any new word formats or message formats that are developed for a 1553 application follow the fundamental guidelines established in this chapter in order to ease future standardization of these words and messages if experience and usage demand it. GRA

N83-20816# Stanford Univ., Calif. Inst. for Mathematical Studies in the Social Sciences.
INFORMATIONAL EQUILIBRIUM
Robert Kast (Southampton Univ.) Sep. 1982 61 p refs Sponsored in part by Minetere Francais des Affaires Etrangeres
(Contract N00014-79-C-0685)
(AD-A121804; SU-TR-382) Avail: NTIS HC A04/MF A01 CSCL 05/2

Decision making over time in an uncertain environment has motivated much research, and given rise to different definitions of equilibria. Research on Temporary Equilibria concentrated on the consistency of agents when making forecasts, together with classical rational behavior under risk. Rational Expectation Equilibria were developed from the seminal paper of Muth until the model of Anderson-Sonnenschein provided an existence theorem: an equilibrium exists if agents make decisions which generate through equilibrium market price; the probability distribution they used in making their decisions. We call Informational Equilibrium an equilibrium of decisions and forecasts of agents in a dynamic process: agents use their forecasts to make their decisions and these decisions generate the system a future distribution which matches the forecasts. The structure of the model is quite general and is not specially related to a sequence of markets. GRA

N83-20817# Stanford Univ., Calif. Information Systems Lab.
SIGNAL ESTIMATION, INVERSE SCATTERING, AND PROBLEMS IN ONE AND TWO DIMENSIONS Final Report, 1 Sep. 1977 - 29 Sep. 1982
Thomas Kailath 1 Nov. 1982 18 p refs
(Contracts DAAG29-77-C-0042; DAAG29-79-C-0215)
(AD-A121787; ARO-15168.17-MA; ARO-16946.40-MA) Avail: NTIS HC A02/MF A01 CSCL 05/2

Several results were obtained on the apparently diverse topics in the title, showing different kinds of relationships between them but with special attention to implication for new estimation algorithms and signal processing and, to a lesser extent, for system theory. The publications resulting from the work are listed by category and date. They are briefly organized and reviewed under five major headings: (1) Two-Dimensional System Theory; (2) Fast Algorithms for Linear Estimation; (3) Adaptive Algorithms in Control Design; (4) Adaptive Identification and Signal Processing; and (5) Stochastic System Modeling and Realization. Author (GRA)

N83-20818# Stanford Univ., Calif. Dept. of Computer Science.
DYNAMIC WEIGHTED DATA STRUCTURES Ph.D. Thesis
Samuel Watkins Bent May 1982 84 p refs
(Contract N00014-76-K-0330; Grant NSF IST-82-01926)
(AD-A122046; SU-STAN-CS-82-916) Avail: NTIS HC A05/MF A01 CSCL 12/1

This thesis discusses implementations of an abstract data structure called a dynamic dictionary. Such a data structure stores a collection of items, each of which is equipped with a key and a weight. Among the operations we might wish to perform on such a collection are: (1) accessing an item, given its key; (2) inserting a new item; (3) deleting an item; (4) joining two collections into one; (5) splitting a collection into two; and (6) changing the weight of an item. Operations (b)-(f) provide the dynamic nature of the data structure. In addition, we want the implementation to respect the weights, so that accessing a heavy item is quicker than accessing a light one. In an optimal binary tree, the path length to an item of weight w in a collection of total weight, W is proportional to log(W/w). By relaxing the optimality constraint and considering different kinds of trees, it is possible to retain this logarithmic access time (with a larger constant factor), and simultaneously achieve similar logarithmic times for the dynamic operations. Two new data structures are proposed, biased 2-3 trees and biased weight-balanced trees. They achieve the logarithmic time bounds provided the cost is amortized over a sequence of operations. These data structures have applications to the network flow problem and to the design of self-organizing data structures. GRA

N83-20819# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
TELEINFORMATION AND MANAGEMENT
Elzbieta Siwak-Szczepek 26 Oct. 1982 16 p Transl. into ENGLISH from Wiad. Telekom. (Poland), n. 4, Apr. 1979 p 107-110
(AD-A122030; FTD-ID(RS)T-1041-82) Avail: NTIS HC A02/MF A01 CSCL 05/2

Characteristics of teleinformation systems and their usefulness in management process are addressed. Author

N83-20820# California Univ., Berkeley. Lawrence Berkeley Lab.
TYPOGRAPHIC DESIGN FOR INTERFACES OF INFORMATION SYSTEMS
Aaron Marcus Jan. 1982 7 p refs Presented at the Conf. on Human Factors in Computer Systems, Washington, D.C., 15 Mar. 1982
(Contract W-7405-eng-48)
(DE82-010179; LBL-13886; CONF-820318-1) Avail: NTIS HC A02/MF A01

Principles of information-oriented graphic design were utilized in redesigning the interface for a large information management system. These principles are explained and examples of typical screen formats are shown to indicate the nature of improvements. DOE

N83-20821# Department of Energy, Oak Ridge, Tenn. Technical Information Center.
ENERGY DATA BASE GUIDE TO ABSTRACTING AND INDEXING
L. T. Whitehead, ed. Dec. 1981 146 p
(DE82-005748; DOE/TIC-4583/R3) Avail: NTIS HC A07/MF A01

The principles employed in abstracting and subject indexing information for its data bases and abstract journals are described. Information on the mission and responsibilities of TIC, the data bases and abstract journals maintained and produced, the associated acquisition, subject categorization, retrieval functions, and other information processing activities is included. DOE

N83-20822# Southwest Research Inst., San Antonio, Tex.
DECENTRALIZED DATA SYSTEMS: RESULTS AND RECOMMENDATIONS
V. B. Parr, L. D. McCullough, B. M. Tashjian, and R. D. Shirley May 1982 476 p refs Sponsored by DOE and EPRI
(DE82-904380; EPRI-NP-2384) Avail: NTIS HC A21/MF A01

A decentralized data system (DDS) is defined as a utility, industry, or regulatory agency data system dealing with power plant performance. A survey of utility, industry, and regulatory agency DDSs was made. Information was gathered on twelve utility data systems, two industry data systems, two regulatory agency data systems and one government-owned utility data system. Existing DDSs that are potential candidates for integration into the Information System for Generation Availability (ISGA) and methods by which that integration can be accomplished are identified. A matrix of the data elements and formats was prepared for the data systems, which allowed comparison to determine which DDSs were potential candidates for integration into the ISGA. Utility data systems emphasize outage data collection. A composite of GADS, NPRDS, and piece-part data from Utah Power and Light encompass nearly all data elements identified in the survey. Of the computer system configurations considered as potentially viable for ISGA, integrated, centralized, interfaced, and distributed, the centralized system for data retrieval is the least expensive to implement, and the most acceptable to the users. DOE

N83-20823# Young (Arthur) and Co., Washington, D. C.
A REPORT DESCRIBING AN APPROACH TO ADP USER SERVICE REPORTING
Jeffery Mohr, Carol Wilson, Peggy Chan, and Kenneth Moore Mar. 1982 97 p refs
(Contract NB80-SBCA-0501)
(PB82-195025; NBS-GCR-82-382) Avail: NTIS HC A05/MF A01

CSCL 05B

An approach to ADP user service reporting is presented which uses the maximization of Net Benefit to the Organization (NBO) as the basic criterion for determining the needed level of ADP service. The goal of the User Service Reporting System (USRS) is to provide each of the groups within the management hierarchy with timely feedback on how well the SDP installation is supporting the needs of the organization. The report discusses the calculation of costs and benefits as well as factors affecting their optimization. The report identifies work units and service measures which are appropriate for a USRS. The usefulness and measurability of the proposed work units and service measures are discussed. A significant bibliography is included. Author (GRA)

N83-20824# National Library of Medicine, Bethesda, Md.
PERMUTED MEDICAL SUBJECT HEADINGS, 1983
1982 374 p refs Revised
(PB83-101089; NLM-MED-82-06) Avail: NTIS HC A16/MF A01 CSCL 05B

A computer-generated display of all terms, i.e., descriptors and cross references, in the alphabetic list of the National Library of Medicine's Medical Subject Headings (MeSH) for 1983, as well as all citation type, check tag, and geographic descriptors in the Annotated Alphabetic MeSH, 1983 is provided. The Permuted MeSH takes each significant work that appears in each MeSH term and then lists all the MeSH terms in which that word appears. Author (GRA)

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N83-20825# Committee on Appropriations (U. S. Senate).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT, AND CERTAIN INDEPENDENT AGENCIES APPROPRIATIONS, 1983, PART 2
Washington GPO 1983 616 p Hearings on H.R. 6956 before the Comm. on Appropriations, 97th Congr., 2nd Sess., 27 Apr., 5 May, 11 May, and 18-19 May 1982
(GPO-15-583) Avail: Comm. on Appropriations

Appropriation hearings for the National Science Foundation, the National Aeronautics and Space Administration, and the Department of Housing and Urban Development-Independent Agencies are presented. For individual titles, see N83-20826 through N83-20826.

N83-20826# Committee on Appropriations (U. S. Senate).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT-INDEPENDENT AGENCIES APPROPRIATIONS FOR 1983: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
In its Dept. of Housing and Urban Develop., and Certain Independent Agencies Appropriations, 1983, Pt. 2 1983 p 1027-1211
(For primary document see N83-20825 10-84)
Avail: Comm. on Appropriations

The NASA budget request for FY 1983 is presented along with an overview of NASA's FY 1983 program. Research and development activities in the areas of space transportation systems, space science, space and terrestrial applications, aeronautics and space technology, and tracking and data acquisition are summarized. Technology utilization, international cooperative activities are covered as well as construction of facilities and research and program management. J.M.S.

N83-20827# Committee on Science and Technology (U. S. House).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION ACT, 1983
1983 11 p A bill referred to the Comm. on Sci. and Technol., 98th Congr., 1st Sess., 7 Mar. 1983
Avail: US Capitol, House Document Room

Appropriations for research and development, construction of facilities, and research and program management, and other purposes are presented. Funding for the space transportation system, physics and astronomy, planetary exploration, life sciences, space applications, technology utilization, and aeronautical research and development are included. S.L.

N83-20828# Committee on Science and Technology (U. S. House).
US SCIENCE AND TECHNOLOGY UNDER BUDGET STRESS
Washington GPO 1982 440 p Hearings before the Comm. on Sci. and Technol., 97th Congr., 1st and 2d Sess., 10 Dec. 1981 and 2, 3, 4 Feb. 1982
(GPO-92-795) Avail: Committee on Science and Technology

The long range planning of scientific and technological development in view of short term budget expediencies is discussed. A comprehensive approach to science policy is considered. S.L.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N83-20829*# Detroit Diesel Allison, Indianapolis, Ind.
SUPPORT AND POWER PLANT DOCUMENTATION FOR THE GAS TURBINE POWERED BUS DEMONSTRATION PROGRAM Final Report, Jan. 1980 - Sep. 1981
D. N. Nigro, R. G. Stewart, and S. A. Apple Mar. 1982 194 p refs
(Contracts DEN3-187; EC-77-A-31-1044)
(NASA-CR-165527; DOE/NASA/0187-82-1; NAS 1.26:165527; DDA-EDR-10885) Avail: NTIS HC A09/MF A01 CSCL 13F

The operational experience obtained for the GT404-4 gas turbine engines in the intercity and intracity Bus Demonstration Programs is described for the period January 1980 through September 1981. Support for the engines and automatic transmissions involved in this program provided engineering and field service, spare parts and tools, training, and factory overhauls. the Greyhound (intercity) coaches accumulated 183,054 mi (294, 595 km) and 5154 hr of total operation. The Baltimore Transit (intracity) coaches accumulated 40,567 mi (65,285 km) and 1840 hr of total operation. In service, the turbine powered Greyhound and Transit coaches achieved approximately 25% and 40% lower fuel mileage, respectively, than did the production diesel powered coaches. The gas turbine engine will require the advanced ceramic development currently being sponsored by the DOE and NASA to achieve fuel economy equivalent not only to that of today's diesel engines but also to the projected fuel economy of the advanced diesel engines of the 1990s. Sufficient experience was not achieved with the coaches prior to the start of service to identify and eliminate many of the problems associated with the startup of new equipment. Because of these problems, the mean miles between incident were unacceptably low. The future gas turbine system should be developed sufficiently to establish satisfactory durability prior to evaluation in revenue service. Commercialization of the gas turbine bus engine remains a viable goal for the future. Author

N83-20830*# American Planning Association, Wichita, Kans. Transportation Planning Div.
PROCEEDINGS OF THE MONTEREY CONFERENCE ON PLANNING FOR ROTORCRAFT AND COMMUTER AIR TRANSPORTATION
Willard L. Stockwell Feb. 1983 184 p refs Conf. held in Monterey, Calif., 31 Aug. - 4 Sep. 1981
(Contract NAS2-10815)
(NASA-CR-166440; NAS 1.26:166440) Avail: NTIS HC A09/MF A01 CSCL 05A

Planning and technological issues involved in rotorcraft and commuter fixed-wing air transportation are discussed. Subject areas include the future community environment, aircraft technology, community transportation planning, and regulatory perspectives. For individual titles, see N83-20831 through N83-20838.

N83-20831*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AMES RESEARCH CENTER OVERVIEW c01
C. Thomas Snyder *In* American Planning Association Proc. of the Monterey Conf. on Planning for Rotorcraft and Commuter Air Transportation Feb. 1983 p 17-21 (For primary document see N83-20830 10-85)
Avail: NTIS HC A09/MF A01 CSCL 05A

The aeronautical research programs of the Ames Research Center are reviewed with particular emphasis on V/STOL aircraft development. Test facilities and simulation capabilities are briefly described. The Tilt Rotor Research Aircraft, X-Wing vehicle, Rotor Systems Research Aircraft, and the Quiet Short Haul Aircraft are discussed. M.G.

N83-20832*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE QUIET SHORT-HAUL RESEARCH AIRCRAFT c05
John A. Cochrane *In* American Planning Association Proc. of the Monterey Conf. on Planning for Rotorcraft and Commuter Air Transportation Feb. 1983 p 22-23 (For primary document see N83-20830 10-85)
Avail: NTIS HC A09/MF A01 CSCL 01C

The design concepts, performance capabilities, and projected applications of the Quiet Short-Haul Research Aircraft (QSRA) are discussed. The propulsive lift system of the QSRA provides the lift required for short field operations at low community noise levels. This system consists of four high bipass ratio, geared turbofan engines mounted so that the engine exhaust flows across the upper surface of the wing (upper surface blowing). Large specially shaped flaps behind each engine control the direction of the flow for each phase of flight. A 95 passenger short haul transport based on this technology could operate out of a 2500 foot runway with a combined takeoff and landing 90 EPNdB footprint area of 2.7 sq mi. M.G.

N83-20833*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE TILT ROTOR RESEARCH AIRCRAFT (XV-15) PROGRAM c05
John P. Magee *In* American Planning Association Proc. of the Monterey Conf. on Planning for Rotorcraft and Commuter Air Transportation Feb. 1983 p 24-33 (For primary document see N83-20830 10-85)
Avail: NTIS HC A09/MF A01 CSCL 01C

The tilt rotor concept is introduced and the performance capabilities and noise characteristics of the XV-15 aircraft are discussed. In hover, the aircraft is lifted by the two wing tip mounted rotors with the nacelles in the vertical position. In this flight mode, the vehicle is a twin rotor helicopter and is controlled by rotor cyclic and collective controls. The aircraft can fly as a helicopter or tilt the nacelle to the propeller mode and operate as a fixed-wing twin turboprop airplane. It is also possible to stop the conversion at any intermediate angle and fly continuously or reconvert. The rotors are powered by two modified T-53 engines and the power train includes a cross shaft located in the wing, to allow for the engine failure case and still retain power to both rotors. M.G.

N83-20834*# Helicopter Association International, Washington, D.C.
ROTORCRAFT AIR TRANSPORTATION c03
Glen A. Gilbert *In* American Planning Association Proc. of the Monterey Conf. on Planning for Rotorcraft and Commuter Air Transportation Feb. 1983 p 73-83 (For primary document see N83-20830 10-85)
Avail: NTIS HC A09/MF A01 CSCL 01C

Intermodal relationships and the particular ways in which they affect public transportation applications of rotorcraft are addressed. Some aspects of integrated services and general comparisons with other transportation modes are reviewed. Two potential application scenarios are discussed: down-to-downtown rotorcraft service and urban public transport rotorcraft service. It is concluded that to integrate well with ground access modes community rotorcraft service should be limited stop service with published schedules, and operate on a few specific routes between a few specific destinations. For downtown-to-downtown service, time savings favorable to rotorcraft are benefits that reflect its more direct access, relatively higher line-haul travel speeds, and less circuitous travel. For the scenario of public transport within urban areas, first, improving cruise speeds has a limited potential due to allowing for a "station spacing" effect. Secondly, public acceptance of higher acceleration/deceleration rates may be just as effective as a technological innovation as achieving higher cruise speeds. M.G.

N83-20835*# Textron Bell Helicopter, Fort Worth, Tex. Acoustics Group.
HELICOPTER NOISE c71
Charles M. Cox *In* American Planning Association Proc. of the Monterey Conf. on Planning for Rotorcraft and Commuter Air Transportation Feb. 1983 p 84-87 ref (For primary document see N83-20830 10-85)
Avail: NTIS HC A09/MF A01 CSCL 20A

Strategies for the reduction of noise at and around heliports are discussed. Heliport planning and operations and piloting techniques are addressed. M.G.

N83-20836*# Vitro Labs., Silver Spring, Md.
COMMUNITY ROTORCRAFT AIR TRANSPORATION: OPPORTUNITIES AND BENEFITS c03
D. J. Freund *In* American Planning Association Proc. of the Monterey Conf. on Planning for Rotorcraft and Commuter Air Transportation Feb. 1983 p 96-106 (For primary document see N83-20830 10-85)
Avail: NTIS HC A09/MF A01 CSCL 01C

Opportunities and benefits of rotorcraft transportation are examined in light of the flight capabilities of rotorcraft. Promising helicopter scenarios include public service, public transportation, energy exploration, construction, cargo, agriculture/forestry, and other business/commercial uses. M.G.

N83-20837*# Vought Corp., Dallas, Tex.
LESSONS FROM THE PAST: STOL SYSTEM STUDIES AND OTTAWA-MONTREAL STOL DEMONSTRATION c03
Robin Ransone *In* American Planning Association Proc. of the Monterey Conf. on Planning for Rotorcraft and Commuter Air Transportation Feb. 1983 p 107-113 refs (For primary document see N83-20830 10-85)
Avail: NTIS HC A09/MF A01 CSCL 01C

The study for the Floating Interim Manhattan STOLPORT is discussed and experiences with public reaction are related. M.G.

N83-20838*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OPPORTUNITIES AND BENEFITS c03
Thomas L. Galloway *In* American Planning Association Proc. of the Monterey Conf. on Planning for Rotorcraft and Commuter Air Transportation Feb. 1983 p 118-136 refs (For primary document see N83-20830 10-85)
Avail: NTIS HC A09/MF A01 CSCL 01C

The service characteristics and changes affecting commuter

airline operations are summarized. Community and passenger considerations are addressed and the benefits identified in NASA-sponsored aircraft studies are discussed. M.G.

N83-20839# Committee on Science and Technology (U. S. House). Subcomm. on Transportation, Aviation and Materials.
ADVANCED RAIL TECHNOLOGY
Washington GPO 1982 50 p Presented to the Comm. on Sci. and Technol., 97th Congr., 2d Sess., Sep. 1982
(GPO-97-792) Avail: US Capitol, House Document Room

The technological needs and opportunities of American rail transportation were assessed in order to lay the basis for a national transportation policy. Although the general focus was on rail technology, interrelated economic and regulatory issues were also discussed. Subjects considered included conventional high speed rail technology and magnetic levitation rail technology, technology transfer and rail industry innovation, the techological and economic feasibility of establity of establishing dedicted high speed rail corridors in the United States, and the proper role of the federal government in promoting the development of a balanced national transportation system. S.L.

N83-20840# Corporate-Tech Planning, Inc., Waltham, Mass.
REVIEW AND EVALUATION OF AUTOMOTIVE FUEL CONSERVATION TECHNOLOGIES, VOLUME 2, APPENDIX C Final Report, Mar. 1979 - Sep. 1981
Theodore Taylor, Jr. Washington DOT Dec. 1981 177 p 2 Vol.
(Contract DOT-HS-9-02110)
(PB83-101154; DOT-HS-806-189-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 13F

Material substitution and component redesign impact on the ability of auto manufacturers to meet fuel economy standards is discussed. Weight reduction through material substitution and component redesign is assessed. Summary tables and data sheets for fourteen materials identified as featuring innovations and research in the areas of material processes available alloys and component applications are presented. S.L.

N83-20841# Little (Arthur D.), Inc., Cambridge, Mass.
CONSUMER PRODUCTS EFFICIENCY STANDARDS ENGINEERING ANALYSIS DOCUMENT
Mar. 1982 320 p refs
(Contract DE-AC03-78CS-20420)
(DE82-012599; DOE/CE-0030) Avail: NTIS HC A14/MF A01

A technical and economic analysis was completed for refrigerators and refrigerator-freezers, freezers, water heaters, furnaces and boilers, clothes dryers, kitchen ranges and ovens, central and room air conditioners. The relationship between the cost of a consumer product and its efficiency was estimated for each product class based on engineering analyses. The engineering basis for these relationships is reported. The general methodology used in making these estimates is described and details of the analysis by product type are given. DOE

N83-20842# California Univ., Livermore. Lawrence Livermore Lab. Transportation Systems Research Dept.
ROUTE PROFILE ANALYSIS TO DETERMINE SUITABILITY OF ELECTRIC POSTAL-DELIVERY VEHICLES
C. E. Walter, M. K. Kong, and D. J. Mullenhoff 14 Dec. 1981 15 p refs Presented at the 32nd Inst. for Elect. and Electron. Engr. Vehicular Technol. Conf., San Diego, Calif., 23 May 1982
(Contract W-7405-eng-48)
(DE82-012216; UCRL-86707; CONF-820531-1) Avail: NTIS HC A02/MF A01

An instrumentation system and computer program were developed that allow the US Postal Service to determine which postal routes are suitable for electric delivery vehicles. The instrumentation system provides route data. The route data and electric vehicle characteristics are used in the computer program to calculate vehicle energy and power requirements for the particular route. The performance characteristics of electric vehicles are contained in an input data file to the computer program. The instrumentation system is designed for use during normal mail delivery with gasoline-powered vehicles. The system is powered by the vehicle battery. Minimum operator interaction and inexpensive maintenance free sensors are featured in the design. Route grade is determined from a pendulum measurement corrected for vehicle acceleration. Acceleration is determined from a measurement of the distance traveled. DOE

N83-20843# Tennessee Valley Authority, Chattanooga. Transportation Projects.
EPRI/TVA PILOT ELECTRIC VEHICLE DEMONSTRATION PROJECT Final Report
C. L. Carter and R. K. Buffett Oct. 1982 113 p ref Sponsored by EPRI
(EPRI Proj. 1136-5)
(DE83-900150; EPRI-EM-2600) Avail: NTIS HC A06/MF A01

Ten Volkswagen electric vehicles - five buses and five vans - operating in a real world environment under controlled conditions were evaluated. Real time and other data were collected on the EVs during the eighteen month period and analyzed to determine their performance capabilities. Route and mission studies were also conducted to determine EV applications within the fleet and to develop an approach for identifying suitable missions for EVs within general utility fleet operations. Summaries of the operation of these vehicles are included along with evaluations of selected components. System energy efficiency, operating and maintenance data are presented for each vehicle. Failure analyses that were performed to determine vehicle and component deficiencies and strengths are also presented. DOE

N83-20844# South Coast Technology, Inc., Ann Arbor, Mich.
REVIEW AND EVALUATION OF AUTOMOTIVE FUEL CONSERVATION TECHNOLOGIES Final Report
H. M. Siegel, R. Schwarz, J. Andon, G. Kollars, T. Gerstenberger, R. Gaines, R. Falk, and S. Renick Washington DOT Dec. 1981 267 p
(Contract DOT-HS-9-02111)
(PB83-101139; DOT-HS-806-107) Avail: NTIS HC A12/MF A01 CSCL 13F

Automotive fuel economy and related safety issues were studied. Consumption estimates of stratified charge rotary engines installed in five vehicles were investigated. Oldsmobile Omega X Body Baseline Weight Data; GM X body Material Substitution Weight Reduction/Cost Effectiveness Study; Calspan RSV Restraint System Cost Study; FMVSS No. 208 Extension to Light Trucks, Vans, and MPV's - Cost Lead Time study; Multipiece Rims for Trucks, Buses, and Trailers; Identifying Design Changes, Cost Impacts and Manufacturing Lead Times to Upgrade FMVSS 114 for Passenger Cars, Trucks, and MPV's; Ford Escort GL Baseline Weight Data. Automobile body weight reductiona and cost effectiveness studies were made. Restraint systems and design changes, were considered in relation to costs and manufacturing impacts. Passenger cars, trucks, buses, and trailers were considered. GRA

N83-20845# Corporate-Tech Planning, Inc., Waltham, Mass.
REVIEW AND EVALUATION OF AUTOMOTIVE FUEL TECHNOLOGIES. VOLUME 1: SUMMARY Final Report, Mar. 1979 - Sep. 1981
Theodore Taylor, Jr. Washington DOT Dec. 1981 89 p 2 Vol.
(Contract DOT-HS-9-02119)
(PB83-101147; DOT-HS-806-188-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 13F

The impact of automotive technologies and the manufacturer's overall product plans on fuel economy requirements was assessed. Automotive technology, manufacturing costs, and industry assessments were analyzed. Specific subject areas of investigation include: potential fuel economy improvements from variable valve timing of internal combustion engines; effects of tire under inflation on fuel economy; reductions in engine friction; automotive applications of metal/plastic laminates as a substitute material; cost, weight and material analyses of light truck; design, cost and weight analyses of truck-trailer rear underride guards; the impact of seat belts comfort and convenience on ehicle manufacturing;

design modifications and manufacturing costs of child seat tether anchorages; and identification of auto manufacturer's technical progress in weight reduction through material substitution and component redesign. GRA

N83-20187# MATRA Service Aerodynamique, Clamart (France).
SAFETY METHODOLOGY APPLIED TO THE LILLE METRO [METHODOLOGIE SECURITE APPLIQUEE AU METRO DE LILLE]
C. Marcovici and B. Le-Trung (Inst. de Rech. des Transports) *In* ESA Reliability and Maintainability Sep. 1982 p 55-63 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20197# Societe Generale de Travaux Electriques, Puteaux (France). Dept. Fiabilite.
THE SAFETY STUDIES FOR THE CARACAS METRO [LES ETUDES DE SECURITE DU METRO DE CARACAS]
J. C. Ligeron and A. Delage *In* ESA Reliability and Maintainability Sep. 1982 p 135-142 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20211# Regie Autonome des Transports Parisiens, Paris (France).
RELIABILITY OF ELECTRONIC ONBOARD CONTROL SYSTEMS IN THE PARIS METRO [FIABILITE DES EQUIPMENTS ELECTRONIQUES EMBARQUES DU PILOTAGE AUTOMATIQUE DU METRO DE PARIS]
P. Cailliez and J. P. Richard *In* ESA Reliability and Maintainability Sep. 1982 p 241-247 refs In FRENCH; ENGLISH summary (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

N83-20219# MATRA Service Aerodynamique, Clamart (France).
AVAILABILITY OF THE LILLE METRO: EVALUATION, DEMONSTRATION, AND FIRST OPERATIONAL RESULTS [DISPONIBILITE DU METRO DE LILLE: EVALUATION, DEMONSTRATION ET PREMIERS RESULTATS OPERATIONNELS]
C. Marcovici *In* ESA Reliability and Maintainability Sep. 1982 p 293-298 refs In FRENCH (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

88 SPACE SCIENCES (GENERAL)

N83-20846*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
SECOND CAMBRIDGE WORKSHOP ON COOL STARS, STELLAR SYSTEMS, AND THE SUN, VOLUME 1
M. S. Giampapa, ed. and L. Golub, ed. 1981 253 p refs Workshop held in Cambridge, Mass., 21-23 Oct. 1981 Sponsored in cooperation with NASA, James Arthur Fund, Langley-Abbot Program of the Smithsonian Inst., and Harvard-Smithsonian Center for Astrophysics 2 Vol.
(NASA-TM-85174; NAS 1.15:85174; SAO-SR-392-Vol-1) Avail: NTIS HC A12/MF A01 CSCL 03B

Solar and stellar atmospheric phenomena and their fundamental physical properties such as gravity, effective temperature and rotation rate, which provides the range in parameter space required to test various theoretical models were investigated. The similarity between solar activity and stellar activity is documented. Some of the topics discussed are: atmospheric structure, magnetic fields, solar and stellar activity, and evolution. For individual titles, see N83-20847 through N83-20872.

N83-20847*# High Altitude Observatory, Boulder, Colo.
CHROMOSPHERIC STRUCTURE IN RELATION TO RADIATION LOSSES c93
R. Grant Athay *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 3-14 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

It is assumed that cool star chromospheres are heated by mechanical energy dissipation that depends quasilinearly on density and cooled by radiation loss and it is shown that the basic properties of chromospheres are determined by the ionization of hydrogen. It is hydrogen ionization that provides the freedom for chromospheres to adjust their radiation losses to balance the prescribed heat input, resulting in an extended region of low temperature gradient. Chromospheric radiation losses in cool stars occur mainly in the strongest spectral lines at wavelengths greater than about 2000 A and the fraction of the chromosphere is effectively thin. The most important lines include Ca II H and K and the infrared triplet and Mg II h and k. The strong lines of other abundant species, are less important because their high excitation energies reduce the collisional excitation rates. Lyman alpha losses are important because of the overwhelming abundance of hydrogen. However, the inability of chromospheres to adjust their Lyman alpha losses limits the geometrical thickness of the effectively thin region in Lyman alpha and limits the total Lyman alpha flux. E.A.K.

N83-20848*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
MODELS OF TRANSITION REGION AND CORONAL PLASMA IN SOLAR LOOP STRUCTURES c92
J. C. Raymond and R. Rosner *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 15-22 refs (For primary document see N83-20846 10-88)
(Contract NAS5-3949)
Avail: NTIS HC A12/MF A01 CSCL 03B

The theory of coronal loops was developed and the simple version of the theory and observations are compared. It is shown that the gross properties of the confined corona can be understood by considering simple hydrostatic equilibrium models. By observing the corona it is apparent that hydrostatic models are seriously inadequate. It is suggested that observations of intensity fluctuations, of persistent up and down flows, of relatively cool matter residing at coronal heights, of apparent spatial co-mingling of hot plasmas at quite different temperatures, need a more sophisticated modeling. E.A.K.

N83-20849*# Lockheed Missiles and Space Co., Palo Alto, Calif.
CHROMOSPHERIC AND CORONAL HEATING MECHANISMS c90
John Leibacher and Robert F. Stein (Michigan State Univ.) *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 23-37 refs (For primary document see N83-20846 10-88)
(Contract NAS5-23758; Grants NsG-7293; NSF AST-79-19465)
Avail: NTIS HC A12/MF A01 CSCL 03B

Dissipation mechanisms in the chromosphere were examined. The problem of a heat flux from a cool region of the star to a hot region of the star, which violates our second law of thermodynamics is discussed. It is suggested that this is caused by a nonthermal energy flux. While convection transports the thermal flux, a very small percentage is converted into a nonthermal flux. The major part of the outgoing convective energy is turned back into the radiation field which gets decoupled from the star when the star becomes transparent and the radiant energy escapes to space. The small nonthermal flux is transmitted upwards and becomes the dominant energy flux still coupled to the star. The importance of recycling of energy via advection and conduction is emphasized. E.A.K.

N83-20850*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
SOLAR ACTIVITY: THE SUN AS AN X-RAY STAR c92
Leon Golub *In its* 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 39-52 refs (For primary

document see N83-20846 10-88)
(Grant NASw-112)
Avail: NTIS HC A12/MF A01 CSCL 03B

The existence and constant activity of the Sun's outer atmosphere are thought to be due to the continual emergence of magnetic fields from the Solar interior and the stressing of these fields at or near the surface layers of the Sun. The structure and activity of the corona are thus symptomatic of the underlying magnetic dynamo and the existence of an outer turbulent convective zone on the Sun. A sufficient condition for the existence of coronal activity on other stars would be the existence of a magnetic dynamo and an outer convective zone. The theoretical relationship between magnetic fields and coronal activity can be tested by Solar observations, for which the individual loop structures can be resolved. A number of parameters however, which enter into the alternative theoretical formulations remain fixed in all Solar observations. To determine whether these are truly parameters of the theory observations need to be extended to nearby stars on which suitable conditions may occur. E.A.K.

N83-20851*# Hulburt (E. O.) Center for Space Research, Washington, D.C. Lab. for Computational Physics.
DYNAMIC PHENOMENA IN CORONAL FLUX TUBES c92
J. T. Mariska and J. P. Boris *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 53-58 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

The study of stellar atmospheres and the determination of specific physical mechanisms, geometries, and magnetic structures by which coronae are maintained is examined. Ultraviolet and soft X-ray components observed in the radiative output of cool stars and the Sun require counterentropic temperature gradients for their explanation. The existence of a hot corona is recognized as a result of mechanical or fluid dynamic effects and the importance of the magnetic field in the heating is accepted. Magnetohydrodynamic energy release associated with the emergence of magnetic flux through the chromosphere and its dynamic readjustment in the corona are major counterentropic phenomena which are considered as primary candidates for corona heating. Systematic plows in coronal flux tubes result from asymmetric heating and systematic flows can exist without substantial chromospheric pressure differences. Author

N83-20852*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
IS ENERGY CONSERVED AT THE FOOT OF THE SOLAR CHROMOSPHERE? c92
Wolfgang Kalkofen *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 59-66 refs (For primary document see N83-20846 10-88)
(Grant NAGw-253)
Avail: NTIS HC A12/MF A01 CSCL 03B

The current empirical models of the solar atmosphere which have kinetic temperatures that are too low at the temperature minimum to balance radiative heating and cooling are examined. It was noted that when there is additional energy input from the dissipation of hydrodynamic waves the apparent imbalance is aggravated. It is suggested that the problem lies in the assumption of a static upper photosphere. It is proposed that the mechanical waves, which further out cause the chromospheric temperature rise, traverse the temperature minimum region with large amplitude and produce the apparent nonconservation of energy as well as other difficulties of the empirical models through nonlinear, time dependent effects. E.A.K.

N83-20853*# Wuerzburg Univ. (West Germany). Inst. fuer Astronomie und Astrophysiks.
THE GENERATION OF ACOUSTIC ENERGY FROM STELLAR CONVECTION ZONES c90
H. U. Bohn *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 67-72 refs Sponsored in part by the German Science Foundation (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

The heating of stellar chromospheres and coronae by the dissipation of acoustic waves is an important heating mechanism. It is only in the lower solar chromosphere that short period acoustic wave heating seems undisputed. The arguments leading to the rejection of the so called acoustic heating theory are derived from comparisons of calculated acoustic energy fluxes with observational or theoretical requirements. E.A.K.

N83-20854*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
A HEATING MECHANISM FOR THE CHROMOSPHERES OF M DWARF STARS c90
M. S. Giampapa, L. Golub, R. Rosner, G. Vaiana, J. L. Linsky (Joint Inst. for Lab. Astrophysics), and S. P. Worden (California Univ., Los Angeles) *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 73-79 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

The atmospheric structure of the dwarf M-stars which is especially important to the general field of stellar chromospheres and coronae was investigated. The M-dwarf stars constitute a class of objects for which the discrepancy between the predictions of the acoustic wave chromospheric/coronal heating hypothesis and the observations is most vivid. It is assumed that they represent a class of stars where alternative atmospheric heating mechanisms, presumably magnetically related, are most clearly manifested. Ascertainment of the validity of a hypothesis to account for the origin of the chromospheric and transition region line emission in M-dwarf stars is proposed. E.A.K.

N83-20855*# High Altitude Observatory, Boulder, Colo.
MOMENTUM AND ENERGY BALANCE IN LATE-TYPE STELLAR WINDS c90
K. B. MacGregor *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 83-97 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

Observations at ultraviolet and X-ray wavelengths indicate that the classical picture of a static stellar atmosphere containing a radiative equilibrium temperature distribution is inapplicable to the majority of late type stars. Mass loss and the presence of atmospheric regions characterized by gas temperatures in excess of the stellar effective temperature appear to be almost ubiquitous throughout the HR diagram. Evidence pertaining to the thermal and dynamical structure of the outer envelopes of cool stars is summarized. These results are compared with the predictions of several theoretical models which were proposed to account for mass loss from latetype stars. Models in which the outflow is thermally radiatively, or wave driven are considered for identification of the physical processes responsible for the observed wind properties. The observed variation of both the wind, thermal and dynamical structure as one proceeds from the supergiant branch toward the main sequence in the cool portion of the HR diagram give consideration to potential mechanisms for heating and cooling the flow from low gravity stars. E.A.K.

N83-20856*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
THE 1980 ROCKET CORONAGRAPH MEASUREMENTS OF THE SOLAR WIND ACCELERATION REGION c92
George L. Withbroe, John L. Kohl, Richard H. Munro (High Altitude Observatory), and Heinz Weiser *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 99-105 refs (For primary document see N83-20846 10-88)
(Grant NsG-5128)
Avail: NTIS HC A12/MF A01 CSCL 03B

Spectroscopic measurements of temperatures, densities and

flow velocities in the solar wind acceleration region provide critical empirical constraints on solar stellar wind theory. Preliminary results of an analysis of H I Lyman-alpha and white light measurements made on 16 February 1980 in a polar coronal region are reported. The hydrogen kinetic temperatures in the observed region were found to be nearly constant with T sub HI approximately equals 10 degrees K at heliocentric distances between 1.5 and 4 solar radii. The outflow velocities were found to be subsonic indicating that the critical point in the observed region was located at r approximately greater than 4 solar radii. R.J.F.

N83-20857*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE IONIZATION STATE IN A GAS WITH A NON-MAXWELLIAN ELECTRON DISTRIBUTION **c76**
S. P. Owocki and J. D. Scudder *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 107-112 refs Prepared in cooperation with the High Altitude Observatory (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 20L

The inferred degree of ionization of a gas is often used in astrophysics as a diagnostic of the gas temperature. In the solar transition region and corona, in the outer atmospheres of cool stars, and in some portions of the interstellar medium), photoionization can be neglected, and the ionization state is fixed by the balance between ion-electron collisional ionization and dielectronic and/or radiative recombination. Under these conditions, higher degrees of ionization result from higher energy ion-electron collisions which are common in a high temperature gas. Actually, ionization occurs through collisions with electrons that have kinetic energies greater than the ionization potential of the given ion, and so the ionization rate depends on to the number of such high-energy electrons in the tail of the electron velocity distribution. High-velocity electrons move across large distances between effective coulomb collisions, and, in a strong temperature or density gradient, the tail can be overpopulated relative to Maxwell-Boltzmann distribution of equivalent energy density. Thus, the ionization rate can also be greatly increased. These effects for a parameterized form of the electron distribution function with an enhanced high-velocity tail, namely the kappa distribution are illustrated. R.J.F.

N83-20858*# Stanford Univ., Calif. Inst. for Plasma Research.
MODIFICATION OF AVERAGE CORONAL PROPERTIES IN THE PRESENCE OF PERIODIC TEMPERATURE AND DENSITY VARIATIONS NEAR THE BASE **c92**
Steven T. Suess (NOAA, Boulder, Colo.) *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 113-120 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

Conductive damping of the transient motion of the solar corona, and the consequences on the average flow field of conductively re-distributed energy are discussed. A particular example is treated. First, a steady solution for solar wind flow is found for a given set of steady boundary conditions, between 1.4 and 28 solar radii. These boundary conditions are that the density is 1.6xEO6 cm-3 and the temperature is 1.6xEO6 degrees. The flow profiles for this initial state are those shown at t=0 in the figures. Then, at t=0, periodic, in phase, sinusoidal variations in temperature and density are initiated and continued indefinitely. The amplitudes of the variations are 5 percent and 7.5 percent for the temperature and density respectively, imposed at 1.4 solar radii. The variations have a period of 1 hour shorter than a coronal transit time, but sufficiently long for the disturbances to propagate for small distances (2 to 3 solar radii). These oscillations are like those that might occur for acoustic oscillations, although no explanation is offered as to how an acoustic oscillation might extend to this radius in the first place. R.J.F.

N83-20859*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
DEPENDENCE OF OPEN STELLAR CORONAL REGIONS ON CORONAL HEATING **c90**
Reiner Hammer *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 121-135 refs (For primary document see N83-20846 10-88)
(Contract F19628-78-C-0058; Grant AF-AFOSR-0020-82)
Avail: NTIS HC A12/MF A01 CSCL 03B

Models of open regions in hot stellar coronae are presented. For a given star these regions depend on the total amount phi sub Mo of coronal heating and on the characteristic length (L) over which this energy is dissipated. The height of the temperature maximum is mainly determined by L. The coronal temperature, the mass loss rate, and the relative fraction of wind energy losses increase strongly with L as long as L is much smaller than the stellar radius. For large L, however, these quantities are only weak functions of L, while they still increase with increasing phi sub Mo. Thus, if the heating occurs close to the stellar surface, the open coronal regions are cool, and most of the energy is used for radiation. Extended coronal heating, on the other hand, leads to hot coronal regions with small base pressure and predominating energy losses due to stellar wind (for large phi sub Mo and/or outward thermal conduction (for small phi sub Mo). R.J.F.

N83-20860*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
EVIDENCE FOR EXTENDED CHROMOSPHERES SURROUNDING RED GIANT STARS **c90**
Robert E. Stencel *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 137-145 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

There is now an increasing amount of both observational evidence and theoretical arguments that regions of partially ionized hydrogen extending several stellar radii are an important feature of red giant and supergiant stars. This evidence is discussed and the implications of the existence of extended chromospheres in terms of the nature of the outer atmospheres of, and mass loss from, cool stars are examined. R.J.F.

N83-20861*# Iowa State Univ. of Science and Technology, Ames.
SHOCK WAVES, ATMOSPHERIC STRUCTURE AND MASS LOSS IN MIRAS **c90**
L. A. Willson and J. N. Pierce (Mankato State Univ.) *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 147-151 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

Large amplitude shock waves are observed to be present in the atmospheres of the Mira variables: spectral line doubling with Delta v > 30 km/s is present in infrared spectra. Even the visible spectra contain some evidence for such shocks. These shocks are sufficiently large to clearly dominate the energy balance of the atmosphere. Mira variables also show symptoms of substantial mass loss rates: they are strong maser and infrared continuum sources and have strong circumstellar absorption features. The pulsation induced shocks which are seen to be present are obvious suspects for causing or enhancing the mass loss from these stars. The Miras thus present an ideal case for the study of dynamical effects on atmospheric structure, since both the dynamics and the results are clearly observable. The results are given of calculations of the thermalization and cooling of the shock heated material passing through shock fronts whose properties were selected to be consistent with both the isothermal models and the spectroscopic observations. R.J.F.

N83-20862*# Carnegie Institution of Washington, D. C.
MAGNETIC FIELDS ON THE SUN **c92**
Robert Howard *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 155-164 refs (For primary document see N83-20846 10-88)
(Contract N00014-81-C-0065; Grants NGR-09-140-015; NSF

AST-80-20445)
Avail: NTIS HC A12/MF A01 CSCL 03B

Synoptic observations of solar magnetic fields are discussed. Seen in long-term averages, the magnetic fields of the Sun show distinctive behavior. The active-region latitudes are characterized by magnetic fields of preceding polarity. The flow of following polarity fields to make up the polar fields is episodic, not continuous. This field motion is a directed poleward flow and is not due to diffusion. The total magnetic flux on the solar surface, which is related linearly to the calcium emission in integrated sunlight, varies from activity minimum to maximum by a factor of 2 or 3. Nearly all this flux is seen at active-region latitudes-only about 1% is at the poles. The total flux of the Sun disappears from the surface at a very rapid rate and is replaced by new flux. All the field and flux patterns that we see originate in active-region latitudes. The polar magnetic fields of the Sun were observed to change polarity recently. The variations of the full-disk solar flux are shown to lead to the proper rotation rate of the Sun, but the phase of the variations is constant for only a year or two at most. R.J.F.

N83-20863*# High Altitude Observatory, Boulder, Colo.
CONVECTIVE DYNAMOS FOR ROTATING STARS c90
Peter A. Gilman *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 165-179 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

Global dynamo theory is applied to the problem of why some stars have field reversing dynamos, and others do not. It is argued that convectively driven dynamos are the most likely source of magnetic fields in stars that have convection zones. R.J.F.

N83-20864*# Hulburt (E. O.) Center for Space Research, Washington, D.C.
SOLAR PLAGES AND THE INTERPRETATION OF STELLAR Ca 2 H AND K LINE VARIATIONS IN LATE TYPE DWARFS c92
J. W. Cook *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 181-189 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

Approximately a dozen late type dwarf stars have been observed by Wilson (1978) to undergo cyclic variability in Ca II H and K line emission which seems analogous to the solar activity cycle. What might be learned about these stars from solar analogies? The Ca II K index is estimated variation of the Sun viewed as a star, and compared with the observed range of Wilson's stellar observations. Results indicate trends of increasing relative variation H-K(max)/H-K(min) with later spectral type, due to decreasing dilutional contribution of residual photospheric flux to a 1 A band at line center, and of increasing relative variation with decreasing relative time of rise to maximum tau rise/tau reminiscent of the observed solar correlation of a quick rise to sunspot maximum with a strong cycle. B.W.

N83-20865*# Oregon Univ., Eugene. Dept. of Physics.
HIGH-SENSITIVITY CIRCULAR POLARIMETRY OF THE SUN, 0.5 - 1.7 MICRONS c92
James C. Kemp *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 191-197 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

Using an isometric (symmetrical) photoelastic-modulator polarimeter and a Cassegrain telescope, broadband polarization measures of the Sun were obtained with unprecedented sensitivity. With an instrumental background of < x 10 to the minus 6th power differential effects delta q = V/I of 1 x 10 to the minus 7th power were detectable. Some results: (1) the lambda dependence of broadband circular polarization in spots was observed out to 1.7 mu, extending the visible-light measurements of Illing, Landman, and Mickey. The q drops to of the order of 1 x 10 to the minus 5 power at 1.2 mu (in a strong spot), then rises at 1.6 mu. While molecules or other special mechanisms must play a role in the visible-light polarization, at lambda > 1.5 mu the q values seem consistent with gray magneto-opacity. (2) By surveying inactive regions upper limits are set to broadband polarization due to global or deep-seated magnetic fields. For a double-toroidal pattern a differential measure is found, q sub b = (q sub ne + q sub sw - q sub nw - q sub - se) 14, at 1.7 mu, of (+1.2 + or = 0.7) x 10 to the minus 7th power a mean from three series in 1981. Based on a simple estimate by L. Biermann this would correspond to deep-down toroidal fields of > or approx 2000 gauss. Extension of this work are discussed. B.W.

N83-20866*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
STELLAR CONTRIBUTIONS TO THE DIFFUSE SOFT X-RAY BACKGROUND c93
Jay Bookbinder, Y. Avni (Weizmann Inst.), L. Golub, R. Rosner (Einstein Observatory), and G. Vaiana *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 201-205 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

One of the results of the EINSTEIN/C.f.A. X-ray stellar survey was a determination of the contribution of the disk stellar population to the galactic component of the diffuse soft (0.28 - 1.0 keV) X-ray background. This analysis employed both binned and unbinned nonparametric statistical methods that have been developed by Avni, et al. (1980). These methods permitted the use of the information contained in both the 22 detections and 4 upper bounds on the luminosities of 26 dM stars in order to derive their luminosity function. Luminosity functions for earlier stellar types are not yet developed. For these earlier stellar types, the median luminosities as determined by Vaiana, et al., are used (1981), which underestimates their contribution to the background. We find that it is the M dwarfs that dominate the disk population stellar contribution to this background. To calculate the contribution of the stellar sources to the background, simple models both for the spatial distribution of the stars and for the properties of the intervening interstellar medium are used. A model is chosen in which all stellar classes have the same functional form for their spatial distribution: an exponentially decreasing distribution above the galactic equatorial plane, and a uniform distribution within the galactic plane for a region of several kiloparsecs centered on the Sun. B.W.

N83-20867*# Toledo Univ., Ohio.
OBSERVATIONS OF FK COMAE STARS c89
Bernard W. Bopp *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 207-217 refs (For primary document see N83-20846 10-88)
(Contract NAG5-67; Grants NAGw-229; NSF AST-77-09450)
Avail: NTIS HC A12/MF A01 CSCL 03A

Observations on the FK Comae stars are described. FK Com, UZ Lib and HD 199178 are compared and related as a group of stars. The crucial observational tests of the proposed evolutionary status of these stars are noted. B.W.

N83-20868*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
ON THE ENIGMA OF FK COMAE c89
F. Walter and G. Basri (California Univ., Berkeley) *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 219-224 refs (For primary document see N83-20846 10-88)
(Grant NSF AST-80-05874)
Avail: NTIS HC A12/MF A01 CSCL 03A

Stellar chromospheric and coronal activity appears ubiquitous among late type stars to the left of the TR-wind boundary line (Linksy and Haisch 1979). The level of activity as measured by the X-ray surface flux is linearly proportional to the stellar angular velocity, with the exception of slowly rotating dwarfs (Walter 1981, 1982; Walter and Bowyer 1981). The peculiar rapidly rotating G

giant FK Comae (Merrill 1948) appears to fit into this pattern. Line widths indicate V sin i = 120 + or - 20 km s(-1) (Bopp and Stencel 1981). FK Comae has strong Ca II H and K and H alpha emission, strong transition region UV lines (Bopp and Stencel 1981), and an X-ray surface flux in good agreement with its rapid rotation (Walter 1981). Yet, FK Comae is an enigmatic star. It is a rapid rotator, but it is not clear why it is a rapid rotator. There is no direct evidence for duplicity; indeed, the upper limit of 20 km s(-1) on the K velocity puts tight constraints on any binary configuration, especially if sin i approx 1, as indicated by the large V sin i. Bopp and Stencel (1981) have suggested that FK Comae is an example of a coalesced W UMa system (Webbink 1976), wherein the orbital angular momentum has become rotational angular momentum of the coalesced star. B.W.

N83-20869*# Pennsylvania State Univ., University Park.
A FLARE EVENT IN THE PECULIAR GIANT FK COMAE c90
Lawrence W. Ramsey and Harold L. Nations *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 225-230 refs (For primary document see N83-20846 10-88)
(Contract F19628-80-C-0036; Grants NSF AST-78-19317; NSF AST-80-25204)
Avail: NTIS HC A12/MF A01 CSCL 03B

Observations are presented of a very energetic flare event in the peculiar rapidly rotating star FK Comae. During this event on June 18th 1981 the usual asymmetrical double peaked H alpha emission feature with an equivalent width (EW) approx 3-4 A changed to a broad emission feature with EW approx 13 A. Sixteen spectra were obtained over 2 hours. Some changes in the emission profile are apparent on this time scale. The following night the enhanced emission persisted but at lower levels and it was substantially redshifted. This event is interpreted in terms of a model where material is injected into a disk co-rotating with the angular velocity of the stellar surface. A localized region of surface activity is conjectured to be the source of the event. B.W.

N83-20870*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A COMPARISON OF CIRCUMSTELLAR GAS AND DUST IN M GIANTS AND SUPERGIANTS c90
Wendy Hagen (Wellesley College), Dale F. Dickinson, Roberta M. Humphreys (Minnesota Univ., Minneapolis), and Robert E. Stencel (Joint Inst. of Lab. Astrophysics) *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 231-238 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

This paper presents the results of a study of circumstellar gas and dust in a larger sample of stars than that of Hagen (1978). The gas-to-dust ratio varies considerably from star to star. The observations were obtained at Cerro Tololo Interamerican Obsevatory and Kitt Peak National Observatory. CS gas was observed with 2.5 and 5.1 A/mm echelle spectra obtained with the 4-meter telescopes. CS dust was observed through infrared photometry done with the CTIO 60 and KPNO 50 telescopes. B.W.

N83-20871*# Indiana Univ., Bloomington.
PREDICTED MAGNITUDES AND COLORS FROM COOL-STAR MODEL ATMOSPHERES c90
Hollis R. Johnson and Thomas Y. Steiman-Cameron *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 239-244 refs (For primary document see N83-20846 10-88)
(Grant NSF AST-79-13149)
Avail: NTIS HC A12/MF A01 CSCL 03B

An intercomparison of model stellar atmospheres and observations of real stars can lead to a better understanding of the relationship between the physical properties of stars and their observed radiative flux. In this spirit we have determined wide-band and narrow-band magnitudes and colors for a subset of models of K and M giant and supergiant stars selected from the grid of 40 models by Johnson, Bernat and Krupp (1980) (hereafter referred to as JBK). The 24 models selected have effective temperatures of 4000, 3800, 3600, 3400, 3200, 3000, 2750 and 2500 K and log g = 0, 1 or 2. Emergent energy fluxes (erg/ sq cm s A) were calculated at 9140 wavelengths for each model. These computed flux curves were folded through the transmission functions of Wing's 8-color system (Wing, 1971; White and Wing, 1978) and through Johnson's (1965) wide-band (BVRIJKLM) system. The calibration of the resultant magnitudes was made by using the absolute calibration of the flux curve of Vega by Schild, et al. (1971). Author

N83-20872*# Hamburg Univ. (West Germany).
HIGH-RESOLUTION IUE OBSERVATIONS OF THE 1981 ECLIPSE OF 32 CYG c89
D. Reimers, A. Che, and K. Hempe *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 245-259 refs Sponsored in part by the Deutsche Forschungsgemeinschaft (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03A

32 Cyg shows a spectacular pure emission line spectrum during eclipse. Six weeks later, most lines, which were observed in emission during eclipse, are seen as P Cygni type profiles with strong absorption components. The lines are formed through line scattering of B star light in the extended atmosphere (wind) of the K supergiant. During eclipse, the emission parts of the P Cyg lines remain visible since the size of the line scattering sphere around the B star is larger than the red giant. Other emission lines are formed in a shock front near the B star (CIV, SiIV, FeIII) and possibly in an accretion disk. The strong FeII UV Mult. 191 lambda lambda 1785-88 A is shown to be formed through optical pumping via FeII UV Mult. 9 photons. The phase dependence of the P Cyg type profiles is modelled by means of line transfer calculations in nonspherical, 3-dimensional geometry with velocity fields. B.W.

N83-20873*# Battelle Columbus Labs., Ohio.
THE NASA SUBORBITAL PROGRAM: A STATUS REVIEW Final Report
Ron Teeter and Bob Reynolds Jan. 1983 130 p refs
(NASA-CR-170084; NAS 1.26:170084; BCL-AP-IL-83-3) Avail: NTIS HC A07/MF A01 CSCL 03B

The status of the NASA suborbital program is reviewed and its importance to astrophysical and geophysical programs is assessed. A survey of past scientific and developmental accomplishments, an examination of the trends in program costs, and an analysis of current and future program roles are included. The technical disciplines examined are primarily those of astronomy/ astrophysics/solar physics and magnetospheric/ionospheric/ atmospheric physics. Author

N83-20242# Mitsubishi Electric Corp., Hyogo (Japan).
A COMPUTER AIDED TEST AND DIAGNOSTIC SYSTEM FOR THE RELIABILITY EVALUATION OF PLASTIC ENCAPSULATED 64 K DYNAMIC RAMS
K. Takakura, M. Iwatsuki, S. Hosomi, M. Fujimoto, K. Higuchi, H. Matsumura, H. Matsumoto, T. Nakano, T. Yoshihara, and S. Takano *In* ESA Reliability and Maintainability Sep. 1982 p 467-474 refs (For primary document see N83-20178 10-38)
Avail: NTIS HC A99/MF A01

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N83-20874*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A FAR-INFRARED STUDY OF N/O ABUNDANCE RATIO IN GALACTIC H 2 REGIONS
Daniel F. Lester (Inst. for Astronomy, Honolulu), Harriet L. Dinerstein (Texas Univ., Austin), Michael W. Werner, Dan M. Watson

(California Univ., Berkeley), and Reinhard L. Genzel (California Univ., Berkeley) Mar. 1983 28 p refs
(NASA-TM-84331; A-9524; NAS 1.15:84331) Avail: NTIS HC A03/MF A01 CSCL 03A

Far-infrared lines of N++ and O++ in several galactic H II regions were measured in an effort to probe the abundance ratio N/O. New measurements are presented for W32 (630.8-0.0), Orion A, and G75.84+0.4. The combination of (N III) 57.3 millimicrons and (O III) 88.4 and 51.8 millimicrons yields measurements of N++/O++ that are largely insensitive to electron temperature, density uncertainties, and to clumping of the ionized gas, due to the similarity of the critical densities for these transitions. In the observed nebulae, N++/O++ should be indicative of N/O, a ratio that is of special importance in nucleosynthesis theory. Measurements are compared with previous measurements of M17 and W51. For nebulae in the solar circle, N++/O++ is greater than the N/O values derived from optical studies of N+/O+ in low ionization zones of the same nebulae. We find that N++/O++ in W43 is significantly higher than for the other H II regions in the sample. Since W43 is located at R = 5 kpc, which is the smallest galactocentric distance in our sample, our data appear consistent with the presence of a negative abundance gradient d(N/O)dR. B.G.

N83-20875*# Minnesota Univ., Minneapolis.
ULTRAVIOLET SPECTROSCOPY OF THE BRIGHTEST SUPERGIANTS IN M31 AND M33 Final Technical Report
R. M. Humphreys (Minnesota Univ.), C. Blaha (Minnesota Univ.), S. DOdorico (European Southern Observatory), T. R. Gull, and P. Benevenuti (European Space Agency) 31 Mar. 1983 44 p
(NASA-TM-85258; NAS 1.15:85258) Avail: NTIS HC A03/MF A01 CSCL 03A

Ultraviolet spectroscopy from the IUE, in combination with groundbased visual and infrared photometry, are to determine the energy distributions of the luminous blue variables, the Hubble-Sandage variables, in M31 and M33. The observed energy distributions, especially in the ultraviolet, show that these stars are suffering interstellar reddening. When corrected for interstellar extinction, the integrated energy distributions yield the total luminosities and black body temperatures of the stars. The resulting bolometric magnitudes and temperatures confirm that these peculiar stars are indeed very luminous, hot stars. They occupy the same regions of the sub B01 vs. log T sub e diagram as do eta Car, P Cyg and S Dor in our galaxy and the LMC. Many of the Hubble-Sandage variables have excess infrared radiation which is attributed to free-free emission from their extended atmospheres. Rough mass loss estimates from the infrared excess yield rates of 0.00001 M sub annual/yr. The ultraviolet spectra of the H-S variables are also compared with similar spectra of eta Car, P Cyg and S For. S.L.

N83-20876*# Maryland Univ., College Park. Dept. of Astronomy.
ULTRAVIOLET COMETARY SPECTROPHOTOMETRY Final Technical Report
Michael F. AHearn Feb. 1983 13 p refs
(Grant NAG5-74)
(NASA-CR-170066; NAS 1.26:170066) Avail: NTIS HC A02/MF A01 CSCL 03A

During the 13 shifts dedicated to observations of Comet Bradfield (including the two European shifts), five high dispersion exposures were obtained with the LWR camera, 27 low dispersion images with the LWR camera, and 36 low dispersion images with the SWP camera of which 5 were observations of the geocoronal background and 4 were taken in a serendipity mode while the nucleus of the comet was centered on the large aperture of the LWR camera. Author

N83-20877*# National Aeronautics and Space Administration, Washington, D. C.
SPACE TELESCOPE
Joseph J. McRoberts Feb. 1982 64 p Original doc. contains color illustrations
(NASA-EP-166; NAS 1.19:166) Avail: NTIS HC A04/MF A01 CSCL 03A

The Space Telescope is discussed. The spacecraft, science instruments, deployment, the Space Telescope Science Institute, and astronomy are discussed. Author

N83-20867*# Toledo Univ., Ohio.
OBSERVATIONS OF FK COMAE STARS
Bernard W. Bopp *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 207-217 refs (For primary document see N83-20846 10-88)
(Contract NAG5-67; Grants NAGw-229; NSF AST-77-09450)
Avail: NTIS HC A12/MF A01 CSCL 03A

N83-20868*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
ON THE ENIGMA OF FK COMAE
F. Walter and G. Basri (California Univ., Berkeley) *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 219-224 refs (For primary document see N83-20846 10-88)
(Grant NSF AST-80-05874)
Avail: NTIS HC A12/MF A01 CSCL 03A

N83-20872*# Hamburg Univ. (West Germany).
HIGH-RESOLUTION IUE OBSERVATIONS OF THE 1981 ECLIPSE OF 32 CYG
D. Reimers, A. Che, and K. Hempe *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 245-259 refs Sponsored in part by the Deutsche Forschungsgemeinschaft (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03A

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N83-20878*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PAIR PRODUCTION IN SUPERSTRONG MAGNETIC FIELDS
Joseph K. Daugherty (North Carolina Univ., Asheville) and Alice K. Harding Feb. 1983 44 p refs Submitted for publication
Avail: NTIS HC A03/MF A01 CSCL 03B

The production of electron-positron pairs by single photons in magnetic fields > 10 to the twelth power G was investigated in detail for photon energies near threshold as well as for the asymptotic limit of high photon energy. The exact attenuation coefficient, which is derived and then evaluated numerically, is strongly influenced by the discrete energy states of the electron and positron. Near threshold, it exhibits a sawtooth pattern as a function of photon energy, and its value is significantly below that predicted by the asymptotic expression for the attenuation coefficient. The energy distributions of the created pair are computed numerically near threshold and analytic expressions are derived in the asymptotic limit. These results indicate that as field strength and photon energy increase, it becomes increasingly probable for the pair to divide the photon energy unequally. This effect, as well as the threshold behavior of the attenuation coefficient, could have important consequences for pulsar models. Author

N83-20879# New Mexico Research Inst., Inc., Alamogordo. Dept. of Physics.
X-RAY ECLIPSES IN AR LAC: PRELIMINARY RESULTS
D. M. Gibson and F. M. Walter 1982 6 p refs Prepared in cooperation with Joint Inst. for Lab. Astrophysics, Boulder, Colo.
(DE82-905801; NP-2905801) Avail: NTIS HC A02/MF A01

Observations of the nearby eclipsing RS CVn binary AR Lac using the Imaging Proportional Counter on the Einstein X-ray Satellite have revealed both primary and secondary minima. The

depth of these soft X-ray minima are about 30% and 10%, respectively, of the flux at quadrature and the variations are relatively smooth. When compared with observations at other wavelengths the following preliminary conclusions appear to be indicated: (1) The surface flux in soft X-rays from both stars is approximately the same. (2) The soft X-ray corona of the G2 IV-V primary (R1 = 1.8 R/sub theta/) is small. Its depth is no more than 10% of the stellar radius. (3) The soft X-ray corona of the KO IV secondary (R2 = 3.1 R/sub theta/) is large and possibly asymmetric. Apparently the corona extends approximately one stellar radii above the spotted side of this active component. (4) No individual small scale structures (e.g., loops) contain more than 10% of the X-ray flux. This tends to indicate the presence of very large (approx. R/sub */) and/or very many (> 20) loops. (5) Coronal temperatures apparently increase (while densities decrease) with distance from the stellar surfaces. Two consequences are the observed lack of hard X-ray and radio eclipses and the likelihood that the quiescent radio emission in this system is thermal (T approx. 2 x 10 to the eight power K) with gyroresonance absorption playing a key role. DOE

N83-20849*# Lockheed Missiles and Space Co., Palo Alto, Calif.
CHROMOSPHERIC AND CORONAL HEATING MECHANISMS
John Leibacher and Robert F. Stein (Michigan State Univ.) *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 23-37 refs (For primary document see N83-20846 10-88)
(Contract NAS5-23758; Grants NsG-7293; NSF AST-79-19465)
Avail: NTIS HC A12/MF A01 CSCL 03B

N83-20853*# Wuerzburg Univ. (West Germany). Inst. fuer Astronomie und Astrophysiks.
THE GENERATION OF ACOUSTIC ENERGY FROM STELLAR CONVECTION ZONES
H. U. Bohn *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 67-72 refs Sponsored in part by the German Science Foundation (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

N83-20854*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
A HEATING MECHANISM FOR THE CHROMOSPHERES OF M DWARF STARS
M. S. Giampapa, L. Golub, R. Rosner, G. Vaiana, J. L. Linsky (Joint Inst. for Lab. Astrophysics), and S. P. Worden (California Univ., Los Angeles) *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 73-79 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

N83-20855*# High Altitude Observatory, Boulder, Colo.
MOMENTUM AND ENERGY BALANCE IN LATE-TYPE STELLAR WINDS
K. B. MacGregor *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 83-97 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

N83-20859*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
DEPENDENCE OF OPEN STELLAR CORONAL REGIONS ON CORONAL HEATING
Reiner Hammer *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 121-135 refs (For primary document see N83-20846 10-88)
(Contract F19628-78-C-0058; Grant AF-AFOSR-0020-82)
Avail: NTIS HC A12/MF A01 CSCL 03B

N83-20860*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
EVIDENCE FOR EXTENDED CHROMOSPHERES SURROUNDING RED GIANT STARS
Robert E. Stencel *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 137-145 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

N83-20861*# Iowa State Univ. of Science and Technology, Ames.
SHOCK WAVES, ATMOSPHERIC STRUCTURE AND MASS LOSS IN MIRAS
L. A. Willson and J. N. Pierce (Mankato State Univ.) *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 147-151 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

N83-20863*# High Altitude Observatory, Boulder, Colo.
CONVECTIVE DYNAMOS FOR ROTATING STARS
Peter A. Gilman *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 165-179 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

N83-20869*# Pennsylvania State Univ., University Park.
A FLARE EVENT IN THE PECULIAR GIANT FK COMAE
Lawrence W. Ramsey and Harold L. Nations *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 225-230 refs (For primary document see N83-20846 10-88)
(Contract F19628-80-C-0036; Grants NSF AST-78-19317; NSF AST-80-25204)
Avail: NTIS HC A12/MF A01 CSCL 03B

N83-20870*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A COMPARISON OF CIRCUMSTELLAR GAS AND DUST IN M GIANTS AND SUPERGIANTS
Wendy Hagen (Wellesley College), Dale F. Dickinson, Roberta M. Humphreys (Minnesota Univ., Minneapolis), and Robert E. Stencel (Joint Inst. of Lab. Astrophysics) *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 231-238 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

N83-20871*# Indiana Univ., Bloomington.
PREDICTED MAGNITUDES AND COLORS FROM COOL-STAR MODEL ATMOSPHERES
Hollis R. Johnson and Thomas Y. Steiman-Cameron *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 239-244 refs (For primary document see N83-20846 10-88)
(Grant NSF AST-79-13149)
Avail: NTIS HC A12/MF A01 CSCL 03B

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N83-20880*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ANTARCTIC METEORITE NEWSLETTER, VOLUME 6, NUMBER 1
Feb. 1983 34 p Sponsored in part by NSF
(NASA-TM-85261; NAS 1.15:85261) Avail: NTIS HC A03/MF A01 CSCL 03B
New areas of meteorite concentration were discovered.

N83-20881*# Lunar and Planetary Inst., Houston, Tex. Publications Office.
CONFERENCE ON PLANETARY VOLATILES
Karen Hrametz and Linda Kofler Oct. 1982 137 p refs Conf. held at Houston, Tex., 9-12 Oct. 1982 Sponsored in part by Lunar and Planetary Inst., and by NSF
(Contract NASw-3389)
(NASA-CR-170063; NAS 1.26:170063; LPI-488) Avail: NTIS HC A07/MF A01 CSCL 03B

Initial and present volatile inventories and distributions in the Earth, other planets, meteorites, and comets; observational evidence on the time history of volatile transfer among reservoirs; and volatiles in planetary bodies, their mechanisms of transport, and their relation to thermal, chemical, geological and biological evolution were addressed. Author

N83-20882*# Lunar and Planetary Inst., Houston, Tex.
THE 45TH ANNUAL METEORITICAL SOCIETY MEETING
Pamela Jones, comp. and LeBecca Turner, comp. 1982 173 p refs Meeting held in St. Louis, 13-16 Sep. 1982 Sponsored in part by Washington Univ.
(Contract NASw-3389)
(NASA-CR-170070; NAS 1.26:170070; LPI-CONTRIB-481) Avail: NTIS HC A08/MF A01 CSCL 03B

Impact craters and shock effects, chondrite formation and evolution, meteorites, chondrules, irons, nebular processes and meteorite parent bodies, regoliths and breccias, antarctic meteorite curation, isotopic studies of meteorites and lunar samples, organics and terrestrial weathering, refractory inclusions, cosmic dust, particle irradiations before and after compaction, and mineralogic studies and analytical techniques are discussed. Author

N83-20883*# Lunar and Planetary Inst., Houston, Tex.
WORKSHOP ON ANTARCTIC GLACIOLOGY AND METEORITES
Colin Bull and Michael E. Lipschutz 1982 59 p refs Presented at the 3rd Intern. Symp. on Antarctic Glaciology (TISAG), Columbus, Ohio, Sep. 1981, and at the Workshop on Antarctic Glaciology and Meteorites, Houston, Tex., 19-21 Apr. 1982
(Contract NASw-3389)
(NASA-CR-170064; NAS 1.26:170064; LPI-TR-82-03) Avail: NTIS HC A04/MF A01 CSCL 03B

The state of knowledge of meteorites and glaciology is summarized, and directions for research are suggested. Author

N83-20884*# Lunar and Planetary Inst., Houston, Tex.
CONFERENCE ON CHONDRULES AND THEIR ORIGINS
Karen Hrametz [1983] 71 p refs Conf. held in Houston, 15-17 Nov. 1982
(Contract NASw-3389)
(NASA-CR-170069; NAS 1.26:170069; LPI-CONTRIB-493) Avail: NTIS HC A04/MF A01 CSCL 03B

Chondrule parent materials, chondrule formation, and post-formational history are addressed. Contributions involving mineralogy petrology, geochemistry, geochronology, isotopic measurements, physical measurements, experimental studies, and theoretical studies are included. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N83-20885*# Maryland Univ., College Park. Dept. of Physics and Astronomy.
THE COMPOSITION OF HEAVY IONS IN SOLAR ENERGETIC PARTICLE EVENTS
C. Y. Fan (Arizona Univ.), G. Gloeckler, and D. Hovestadt (Max-Planck-Institut fuer Physik und Astrophysik) [1983] 76 p refs
(Grants NGR-03-002-107; NGR-21-002-224; NGR-21-002-316; NAGw-101)
(NASA-CR-170067; NAS 1.26:170067; PP-83-124) Avail: NTIS HC A05/MF A01 CSCL 03B

The elemental, charge state, and isotopic composition of < or approximately 1 to > or approximately 20 MeV per nucleon ions in solar energetic particle (SEP) events was determined and current understanding of the nature of solar and interplanetary processes which may explain the observations are outlined. The composition within individual SEP events may vary both with time and energy, and will in general be different from that in other SEP events. Average values of relative abundances measured in a large number of SEP events, however are found to be roughly energy independent in the approximately 1 to approximately 20 MeV per nucleon range, and show a systematic deviation from photospheric abundances which seem to be organized in terms of the first ionization potential of the ion. Direct measurements of the charge states of SEPs have revealed the surprisingly common presence of energetic He(+) along with heavy ions with typical coronal ionization states. High resolution measurements of isotopic abundance ratios in a small number of SEP events show these to be consistent with the universal composition except for the puzzling overabundance of the SEP Ne-22 relative to this isotopes ratio in the solar wind. S.L.

N83-20886*# Maryland Univ., College Park. Dept. of Physics and Astronomy.
THE COMPOSITION OF HEAVY IONS IN SOLAR ENERGETIC PARTICLE EVENTS
C. Y. Fan (Arizona Univ., Tucson), G. Gloeckler, and D. Hovestadt (Max-Planck-Inst. fuer Physik und Astrophysik, Munich) 1983 77 p refs
(Grants NGR-03-002-107; NGR-21-002-224; NGR-21-002-316; NAGw-101)
(NASA-CR-169994; NAS 1.26:169994; PP-83-124) Avail: NTIS HC A05/MF A01 CSCL 03B

Recent advances in determining the elemental, charge state, and isotopic composition of < or approximate to 1 to > or approximate to 20 MeV per nucleon ions in solar energetic particle (SEP) events and outline our current understanding of the nature of solar and interplanetary processes which may explain the observations. Average values of relative abundances measured in a large number of SEP events were found to be roughly energy independent in the approx. 1 to approx. 20 MeV per nucleon range, and showed a systematic deviation from photospheric abundances which seems to be organized in terms of the first ionization potential of the ion. Direct measurements of the charge states of SEPs revealed the surprisingly common presence of energetic He(+) along with heavy ion with typically coronal ionization states. High resolution measurements of isotopic abundance ratios in a small number of SEP events showed these to be consistent with the universal composition except for the puzzling overabundance of the SEP(22)Ne/(20)Ne relative to this isotopes ratio in the solar wind. The broad spectrum of observed elemental abundance variations, which in their extreme result in composition anomalies characteristic of (3)He rich, heavy ion rich and carbon poor SEP events, along with direct measurements of the ionization states of SEPs provided essential information on the physical characteristics of, and conditions in the source regions, as well as important constraints to possible models for SEP production. Author

N83-20887*# Maryland Univ., College Park. Astronomy Program.
GROUND BASED SOLAR RADIO OBSERVATIONS DURING SOLAR MAXIMUM MISSION Final Report
M. R. Kundu 16 Mar. 1983 7 p refs
(Grant NsG-5320)
(NASA-CR-170011; NAS 1.26:170011) Avail: NTIS HC A02/MF A01 CSCL 03B

The Very Large Array (VLA) and the Westerbork Synthesis Radio Telescope (WSRT) were used for making aperture synthesis maps of solar active and flaring regions. Observations of the Flare buildup in the form of increased intensity and polarization were made. Ring structure associated with sunspots were interpreted

as due to the existence of cool material above the spot. Model computations were performed to explain the total intensity and polarization structures of a continuous set of active region maps. B.G.

N83-20888# Emmanuel Coll., Boston, Mass. Physics Research Lab.
STUDY AND ANALYZE ENERGETIC PARTICLE AND MAGNETIC ACTIVITY DATA Final Report, 1 Apr. 1979 - 31 Mar. 1982
L. Gentile, Ernest G. Holeman, A. Huber, J. Pantazis, and Daniel R. Parsignault Jun. 1982 351 p refs
(Contract F19628-79-C-0102; AF Proj. 2311)
(AD-A121994; AFGL-TR-82-0217) Avail: NTIS HC A16/MF A01 CSCL 03/2

In the areas of communication and surveillance, where there may exist an inability to predict solar particle effects on atmospheric and ionospheric environmental conditions, our research effort has been directed toward the design, development, and construction of energetic particle detection instrumentation for satellite flight. Our instruments measure energetic particle fluxes, discriminate species (electrons, protons, and/or ions), and perform energy analyses; are capable of discovering new scientific knowledge concerning the near-earth space energetic particle environment, and are compatible with Air Force satellite rides. The effort has covered the entire spectrum from design thru construction and integration into the host satellite vehicle. All instrumentation was adapted to current research needs. New devices such as position-sensitive detectors, microprocessors, and magnetic materials were integrated into current designs to obtain maximum spatial, angular and energy resolution consistent with reliability and delivery schedules. Reports on all aspects of the instrumentation and data formats were prepared for utilization and interpretation in analyses which were performed on the final data. Author (GRA)

N83-20889*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
GEOCORONAL IMAGING WITH DYNAMICS EXPLORER: A FIRST LOOK
R. L. Rairden, L. A. Frank, and J. D. Craven Sep. 1982 25 p refs Submitted for publication
(Contracts NAS5-24293; N00014-76-C-0016); Grant NGL-16-001-002
(NASA-CR-169961; NAS 1.26:169961; AD-A122345; U-of-IOWA-82-22) Avail: NTIS HC A02/MF A01 CSCL 03B

The ultraviolet photometer of the University of Iowa spin-scan auroral imaging instrumentation on board Dynamics Explorer-1 has returned numerous hydrogen Lyman alpha images of the geocorona from altitudes of 570 km to 23,300 km (1.09 R sub E to 4.66 R sub E geocentric radial distance). The hydrogen density gradient is shown by a plot of the zenith intensities throughout this range, which decrease to near celestial background values as the spacecraft approaches apogee. Characterizing the upper geocorona as optically thin (single-scattering), the zenith intensity is converted directly to vertical column density. This approximation loses its validity deeper in the geocorona, where the hydrogen is demonstrated to be optically thick in that there is no Lyman alpha limb brightening. Further study of the geocoronal hydrogen distribution will require computer modeling of the radiative transfer. GRA

N83-20890# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA. PART 1: PROMPT REPORTS, DATA FOR MAY 1982, APRIL 1982 AND LATE DATA. EXPLANATION OF DATA REPORTS ISSUED AS NUMBER 450 (SUPPLEMENT) FEBRUARY 1982
Helen E. Coffey, ed. Jun. 1982 154 p 2 Vol.
(PB83-11393; SGD-454-Pt-1; NOAA-820806041-Pt-1) Avail: NTIS HC A08/MF A01 CSCL 03B

This prompt report provides data for June 1982 on: alert periods, daily solar indices, solar flares, solar radio emission, solar wind measurements, inferred interplanetary magnetic field polarities, mean solar magnetic field, spacecraft observations, and Boulder Geomagnetic Substorm Log. It also provides data for May 1982 on: daily solar activity centers, sudden ionospheric disturbances, spacecraft observations, solar radio emission, cosmic rays, geomagnetic indices and radio propagation indices. Late data includes solar radio emission March 1982, and cosmic rays January-March 1982. GRA

N83-20891# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA. PART 2: COMPREHENSIVE REPORTS, DATA FOR DECEMBER 1981 AND MISCELLANEA. EXPLANATION OF DATA REPORTS ISSUED AS NUMBER 450 (SUPPLEMENT) FEBRUARY 1982. LATE DATA AND ERRATA
Helen E. Coffey, ed. Jun. 1982 52 p refs 2 Vol.
(PB83-111401; SGD-454-Pt-2; NOAA-82080605-Pt-2) Avail: NTIS HC A04/MF A01 CSCL 03B

Data on solar radio emission, solar X-ray radiation, and mass ejections from the Sun is presented. Miscellaneous data includes active solar maps, and IMP electrons, protons, alphas. GRA

N83-20848*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
MODELS OF TRANSITION REGION AND CORONAL PLASMA IN SOLAR LOOP STRUCTURES
J. C. Raymond and R. Rosner *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 15-22 refs (For primary document see N83-20846 10-88)
(Contract NAS5-3949)
Avail: NTIS HC A12/MF A01 CSCL 03B

N83-20850*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
SOLAR ACTIVITY: THE SUN AS AN X-RAY STAR
Leon Golub *In its* 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 39-52 refs (For primary document see N83-20846 10-88)
(Grant NASw-112)
Avail: NTIS HC A12/MF A01 CSCL 03B

N83-20851*# Hulburt (E. O.) Center for Space Research, Washington, D.C. Lab. for Computational Physics.
DYNAMIC PHENOMENA IN CORONAL FLUX TUBES
J. T. Mariska and J. P. Boris *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 53-58 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

N83-20852*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
IS ENERGY CONSERVED AT THE FOOT OF THE SOLAR CHROMOSPHERE?
Wolfgang Kalkofen *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 59-66 refs (For primary document see N83-20846 10-88)
(Grant NAGw-253)
Avail: NTIS HC A12/MF A01 CSCL 03B

N83-20856*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
THE 1980 ROCKET CORONAGRAPH MEASUREMENTS OF THE SOLAR WIND ACCELERATION REGION
George L. Withbroe, John L. Kohl, Richard H. Munro (High Altitude Observatory), and Heinz Weiser *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 99-105 refs (For primary document see N83-20846 10-88)
(Grant NsG-5128)
Avail: NTIS HC A12/MF A01 CSCL 03B

N83-20858*# Stanford Univ., Calif. Inst. for Plasma Research.
MODIFICATION OF AVERAGE CORONAL PROPERTIES IN THE

PRESENCE OF PERIODIC TEMPERATURE AND DENSITY VARIATIONS NEAR THE BASE
Steven T. Suess (NOAA, Boulder, Colo.) *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 113-120 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

N83-20862*# Carnegie Institution of Washington, D. C.
MAGNETIC FIELDS ON THE SUN
Robert Howard *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 155-164 refs (For primary document see N83-20846 10-88)
(Contract N00014-81-C-0065; Grants NGR-09-140-015; NSF AST-80-20445)
Avail: NTIS HC A12/MF A01 CSCL 03B

N83-20864*# Hulburt (E. O.) Center for Space Research, Washington, D.C.
SOLAR PLAGES AND THE INTERPRETATION OF STELLAR Ca 2 H AND K LINE VARIATIONS IN LATE TYPE DWARFS
J. W. Cook *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 181-189 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

N83-20865*# Oregon Univ., Eugene. Dept. of Physics.
HIGH-SENSITIVITY CIRCULAR POLARIMETRY OF THE SUN, 0.5 - 1.7 MICRONS
James C. Kemp *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 191-197 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N83-20892*# Wisconsin Univ., Madison. Dept. of Physics.
THE SOFT X-RAY DIFFUSE BACKGROUND
D. McCammon, D. N. Burrows, W. T. Sanders, and W. L. Kraushaar [1982] 76 p refs
(Grant NGL-50-002-044)
(NASA-CR-170062; NAS 1.26:170062) Avail: NTIS HC A05/MF A01 CSCL 03B

Maps of the diffuse X-ray background intensity covering essentially the entire sky with approx. 7 deg spatial resolution are presented for seven energy bands. The data were obtained on a series of ten sounding rocket flights conducted over a seven-year period. The different nature of the spatial distributions in different bands implies at least three distinct origins for the diffuse X-rays, none of which is well-understood. At energies > or approx. 2000 eV, an isotropic and presumably extraglalactic 500 and 1000 eV, an origin which is at least partially galactic seems called for. At energies < 284 eV, the observed intensity is anticorrelated with neutral hydrogen column density, but we find it unlikely that this anticorrelation is simply due to absorption of an extragalactic or halo source. Author

N83-20847*# High Altitude Observatory, Boulder, Colo.
CHROMOSPHERIC STRUCTURE IN RELATION TO RADIATION LOSSES
R. Grant Athay *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 3-14 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

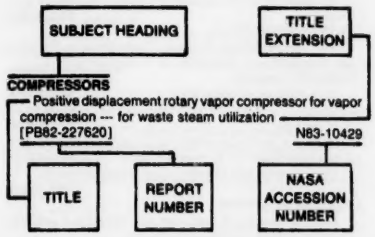
N83-20866*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
STELLAR CONTRIBUTIONS TO THE DIFFUSE SOFT X-RAY BACKGROUND
Jay Bookbinder, Y. Avni (Weizmann Inst.), L. Golub, R. Rosner (Einstein Observatory), and G. Vaiana *In* Smithsonian Astrophysics Observatory 2nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, Vol. 1 1981 p 201-205 refs (For primary document see N83-20846 10-88)
Avail: NTIS HC A12/MF A01 CSCL 03B

99 GENERAL

N83-20893# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES, VOLUME 36, NUMBER 9
Donald R. Barr and Don J. Peters 30 Sep. 1982 43 p
(AD-A121991; ESN-36-9) Avail: NTIS HC A03/MF A01 CSCL 05/1

This is a monthly publication presenting brief articles concerning recent developments in European Scientific Research. Some of the articles included in this report areas follows: Solid Propellants and Explosives; A Decision Aid for Classifying Patterns; Cambridge Color Vision Meeting; Advances in Nuclear Magnetic Resonance of Biological Systems; A Workshop on Invertebrate Respiratory Proteins; Polymer Research; The UK End of the DARPA Internet; Monolithic Microwave Flourishes at CISE; Metallurgical Programs at Two Aerospace Research Centers; International Powder Metallurgy Conference; Underwater Acoustic Transducer Manufacture in France; Solitons '82; Scott Russell Centenary Conference Part 1; Surface-Related Physics; Practical Bayesian Statistics; and Statistical Research at Royal Holloway College. GRA

Typical Subject Index Listing



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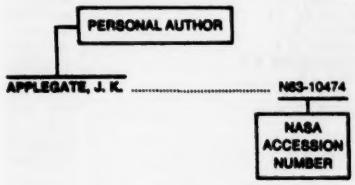

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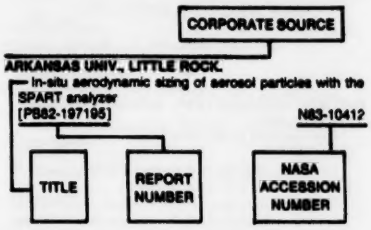

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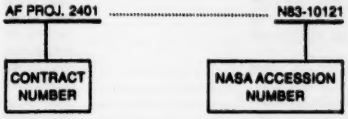

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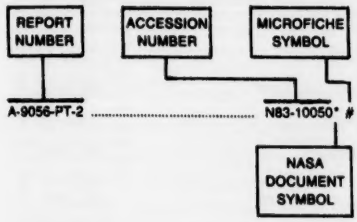

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NRC-20654 ..... N83-20478 #

NRL-MR-4903 ..... N83-20674 #
NRL-MR-4918 ..... N83-19952 #
NRL-MR-4934 ..... N83-20276 #
NRL-MR-4939 ..... N83-20019 #
NRL-MR-4941 ..... N83-20780 #
NRL-MR-4948 ..... N83-20722 #
NRL-MR-4951 ..... N83-20592 #
NRL-MR-4958 ..... N83-19912 #
NRL-MR-4971 ..... N83-19979 #
NRL-MR-4977 ..... N83-20056 #

NRL-4932 ..... N83-20721 #
NRL-4946 ..... N83-19934 #
NRL-8550 ..... N83-19849 #
NRL-8618 ..... N83-20106 #
NRL-8633 ..... N83-20517 #
NRL-8635 ..... N83-19986 #

NSF/CEE-82026 ..... N83-19964 #
NSF/CEE-82027 ..... N83-20305 #
NSF/CEE-82029 ..... N83-20304 #
NSF/CEE-82032 ..... N83-20487 #

NSF/MEA-7882006 ..... N83-20174 #

NSF/PRA-82012 ..... N83-20438 #

NSMRL-929 ..... N83-20535 #

NSWC/MP-82-214 ..... N83-19927 #

NSWC/TR-82-298 ..... N83-19928 #

NUREG/CR-2604 ..... N83-20750 #

NWC-TP-6382 ..... N83-19926 #
NWC-TP-6397 ..... N83-19930 #

NWSC/CR-RDTR-127 ..... N83-19982 #

NZERDC-66 ..... N83-20412 #
NZERDC-68 ..... N83-20411 #

OEHL-81-40 ..... N83-20087 #

OPD-TR-82-033-01 ..... N83-20519 #

ORC-82-5 ..... N83-20677 #

ORI-TR-1653 ..... N83-20311* #

ORNDETPAS-8 ..... N83-20516 #

ORNL/MIT-338 ..... N83-19878 #

ORNL/SUB-79/21453/11 ..... N83-20091 #
ORNL/SUB-81-21099/1-02 ..... N83-20788 #

ORNL/TM-6433 ..... N83-19823 #
ORNL/TM-7680-S1 ..... N83-19945 #
ORNL/TM-8123 ..... N83-20548 #
ORNL/TM-8181 ..... N83-20453 #

OSD/FCTC-81-105 ..... N83-20631 #
OSD/FCTC-81-130 ..... N83-20616 #
OSD/FCTC-81-131 ..... N83-20629 #
OSD/FCTC-81-141 ..... N83-20625 #
OSD/FCTC-82-110 ..... N83-20627 #
OSD/FCTC-82-125 ..... N83-20623 #

OSD/FSTC-82-140 ..... N83-20632 #
OSD/FSTC-82-141 ..... N83-20620 #
OSD/FSTC-82-146 ..... N83-20622 #

OSD/FSTC-82-150 ..... N83-20633 #
OSD/FSTC-82-151 ..... N83-20628 #
OSD/FSTC-82-170 ..... N83-20626 #
OSD/FSTC-82-173 ..... N83-20630 #
OSD/FSTC-82/145 ..... N83-20617 #
OSD/FSTC-82/171 ..... N83-20618 #
OSD/FSTC-82/174 ..... N83-20619 #

OTA-BP-T-14 ..... N83-19731 #

OTA-H-181 ..... N83-20551 #

OTA-STI-178 ..... N83-19764 #

OWRT-A-023-GUAM(2) ..... N83-20340 #
OWRT-A-053-LA(1) ..... N83-20466 #
OWRT-A-080-IA(1) ..... N83-20464 #

OWRT-B-064-IA(1) ..... N83-20357 #
OWRT-B-064-KY(1) ..... N83-20346 #
OWRT-B-112-IND(1) ..... N83-20345 #

OWRT-C-00151-D(0523)(1) ..... N83-19884 #
OWRT-C-00154-D(0508)(1) ..... N83-19883 #
OWRT-C-00192-T(0496)(2) ..... N83-20465 #

PB82-195025 ..... N83-20823 #
PB82-246885 ..... N83-19720 #
PB83-10467 ..... N83-20440 #
PB83-11393 ..... N83-20890 #
PB83-11690 ..... N83-20573 #
PB83-100065 ..... N83-20436 #
PB83-100305 ..... N83-20488 #
PB83-100321 ..... N83-20027 #
PB83-100404 ..... N83-20305 #
PB83-100412 ..... N83-20471 #
PB83-100461 ..... N83-19962 #
PB83-100503 ..... N83-20670 #
PB83-100511 ..... N83-19966 #
PB83-100602 ..... N83-20068 #
PB83-100628 ..... N83-20067 #
PB83-100651 ..... N83-20771 #
PB83-100669 ..... N83-20772 #
PB83-100677 ..... N83-20773 #
PB83-100685 ..... N83-20774 #
PB83-100693 ..... N83-20671 #
PB83-100701 ..... N83-20069 #
PB83-100727 ..... N83-20775 #
PB83-100735 ..... N83-20776 #
PB83-100750 ..... N83-20070 #
PB83-100768 ..... N83-20071 #
PB83-100784 ..... N83-20072 #
PB83-100792 ..... N83-20073 #
PB83-100826 ..... N83-20174 #
PB83-100990 ..... N83-19964 #
PB83-101014 ..... N83-20487 #
PB83-101048 ..... N83-20304 #
PB83-101089 ..... N83-20824 #
PB83-101139 ..... N83-20844 #
PB83-101147 ..... N83-20845 #
PB83-101154 ..... N83-20840 #
PB83-101238 ..... N83-20285 #
PB83-101253 ..... N83-20509 #
PB83-101329 ..... N83-20459 #
PB83-101337 ..... N83-20460 #
PB83-101840 ..... N83-20529 #
PB83-101964 ..... N83-20717 #
PB83-101972 ..... N83-20611 #
PB83-102061 ..... N83-20716 #
PB83-102293 ..... N83-20510 #
PB83-102301 ..... N83-20441 #
PB83-102319 ..... N83-19963 #
PB83-102327 ..... N83-20442 #
PB83-102335 ..... N83-20437 #
PB83-102350 ..... N83-19899 #
PB83-102368 ..... N83-20807 #
PB83-102699 ..... N83-20352 #
PB83-102707 ..... N83-20355 #
PB83-102715 ..... N83-20354 #
PB83-102772 ..... N83-19764 #
PB83-103176 ..... N83-20339 #
PB83-103192 ..... N83-20353 #
PB83-103416 ..... N83-20325 #
PB83-103432 ..... N83-20358 #
PB83-103440 ..... N83-20000 #
PB83-103507 ..... N83-20001 #
PB83-103549 ..... N83-20175 #
PB83-104075 ..... N83-20587 #
PB83-104083 ..... N83-20586 #
PB83-104109 ..... N83-20616 #
PB83-104117 ..... N83-20615 #
PB83-104125 ..... N83-20614 #
PB83-104133 ..... N83-20613 #
PB83-104141 ..... N83-20621 #
PB83-104158 ..... N83-20620 #
PB83-104166 ..... N83-20618 #

PB83-104174 ..... N83-20619 #
PB83-104471 ..... N83-20588 #
PB83-104497 ..... N83-20617 #
PB83-104505 ..... N83-20628 #
PB83-104513 ..... N83-20627 #
PB83-104547 ..... N83-20626 #
PB83-104554 ..... N83-20625 #
PB83-104562 ..... N83-20624 #
PB83-104570 ..... N83-20623 #
PB83-104588 ..... N83-20622 #
PB83-104596 ..... N83-20633 #
PB83-104604 ..... N83-20632 #
PB83-104612 ..... N83-20631 #
PB83-104620 ..... N83-20630 #
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PB83-105064 ..... N83-20463 #
PB83-105098 ..... N83-20356 #
PB83-105114 ..... N83-20074 #
PB83-105171 ..... N83-19960 #
PB83-105247 ..... N83-20075 #
PB83-105494 ..... N83-20176 #
PB83-105528 ..... N83-20351 #
PB83-105536 ..... N83-20467 #
PB83-105544 ..... N83-20450 #
PB83-105593 ..... N83-20438 #
PB83-105601 ..... N83-20350 #
PB83-105734 ..... N83-20349 #
PB83-106237 ..... N83-20468 #
PB83-106443 ..... N83-20511 #
PB83-107003 ..... N83-20585 #
PB83-107037 ..... N83-20348 #
PB83-107128 ..... N83-20347 #
PB83-107334 ..... N83-20341 #
PB83-107391 ..... N83-19961 #
PB83-107425 ..... N83-20306 #
PB83-107441 ..... N83-20461 #
PB83-107466 ..... N83-20462 #
PB83-107474 ..... N83-20173 #
PB83-107482 ..... N83-19959 #
PB83-107714 ..... N83-19965 #
PB83-108019 ..... N83-20340 #
PB83-108050 ..... N83-20464 #
PB83-108068 ..... N83-19883 #
PB83-108084 ..... N83-20357 #
PB83-108126 ..... N83-20346 #
PB83-108134 ..... N83-20465 #
PB83-108142 ..... N83-20466 #
PB83-108191 ..... N83-20345 #
PB83-108639 ..... N83-19884 #
PB83-109546 ..... N83-20338 #
PB83-109587 ..... N83-20342 #
PB83-109660 ..... N83-20612 #
PB83-109884 ..... N83-19881 #
PB83-109918 ..... N83-19946 #
PB83-109934 ..... N83-20550 #
PB83-109959 ..... N83-20343 #
PB83-110007 ..... N83-20528 #
PB83-110148 ..... N83-19882 #
PB83-110296 ..... N83-20806 #
PB83-110379 ..... N83-20530 #
PB83-110585 ..... N83-19731 #
PB83-110874 ..... N83-20344 #
PB83-110908 ..... N83-20489 #
PB83-111252 ..... N83-20486 #
PB83-111401 ..... N83-20891 #
PB83-111484 ..... N83-20307 #
PB83-111583 ..... N83-20549 #
PB83-111591 ..... N83-20061 #
PB83-111609 ..... N83-20777 #
PB83-111682 ..... N83-20572 #
PB83-112177 ..... N83-20470 #
PB83-112268 ..... N83-20527 #
PB83-112433 ..... N83-20525 #
PB83-113274 ..... N83-20551 #
PB83-113522 ..... N83-19727 #
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PB83-113548 ..... N83-19729 #
PB83-113555 ..... N83-19730 #
PB83-113753 ..... N83-19967 #
PB83-114801 ..... N83-20505 #
PB83-114819 ..... N83-20506 #
PB83-114827 ..... N83-20507 #
PB83-114835 ..... N83-20508 #
PB83-117366 ..... N83-20469 #
PB83-121723 ..... N83-20439 #
PB83-200289 ..... N83-20734 #

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PD-81-7 ..... N83-19799* #

PERLAB-002 ..... N83-20562 #

PNL-SA-10223 ..... N83-20738 #
PNL-SA-10407 ..... N83-20740 #

PNL-4098 ..... N83-20739 #
PNL-4108 ..... N83-20741 #
PNL-4306 ..... N83-20504 #

POLY-M/AE-82-9 ..... N83-20059 #

POLY-MRI-1435-82 ..... N83-20017 #

PP-83-124 ..... N83-20885* #
PP-83-124 ..... N83-20886* #

PPG-640 ..... N83-20779 #

PR-2 ..... N83-20334 #
PR-2 ..... N83-20731 #

PRI-56 ..... N83-20787 #

PSI-TR-184-VOL-1 ..... N83-20104 #

PSR-1130-PT-1 ..... N83-20518 #

PTPT-82-10 ..... N83-20160 #

PTR-1092-82-7 ..... N83-20561 #

PWA-5594-180 ..... N83-19753* #

QPR-5 ..... N83-19858 #

QR-6 ..... N83-20458 #
QR-11 ..... N83-20091 #

QTPR-1 ..... N83-19861 #
QTPR-5 ..... N83-19857 #
QTPR-6 ..... N83-20457 #

QTR-2 ..... N83-20382 #
QTR-15 ..... N83-19987 #

R-82-915729-11 ..... N83-19880 #

RAD-81-203-001-12-23-VOL-1 ..... N83-20459 #
RAD-81-203-001-12-23-VOL-2 ..... N83-20469 #
RAD-81-203-001-12-24-VOL-3 ..... N83-20460 #

RADC-TR-82-194-VOL-1 ..... N83-20600 #
RADC-TR-82-199 ..... N83-19985 #
RADC-TR-82-239 ..... N83-20018 #
RADC-TR-82-247 ..... N83-20277 #
RADC-TR-82-265 ..... N83-20760 #

RAE-TM-FS-449 ..... N83-20704

RAE-TM-SPACE-311 ..... N83-19789

RAE-TR-82030 ..... N83-20707
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RAND/N-1834-RC ..... N83-20093 #

RAND/P-6798 ..... N83-20813 #

RAND/R-2899-CEC ..... N83-20363 #

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REPT-1 ..... N83-20767 #
REPT-2-82 ..... N83-20672 #
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REPT-8-82 ..... N83-20678 #
REPT-8A/81 ..... N83-20001 #
REPT-24 ..... N83-20488 #
REPT-78-01-44-18 ..... N83-20771 #
REPT-78-01-44-19 ..... N83-20772 #
REPT-78-01-44-21 ..... N83-20773 #
REPT-78-01-44-22 ..... N83-20774 #
REPT-78-04-08-7 ..... N83-20069 #
REPT-78-04-09-3 ..... N83-20070 #
REPT-78-04-09-5 ..... N83-20071 #
REPT-78-04-09-6 ..... N83-20068 #
REPT-78-04-09-7 ..... N83-20067 #
REPT-78-04-09-8 ..... N83-20073 #
REPT-78-04-09-9 ..... N83-20072 #
REPT-78-04-09-10 ..... N83-20671 #
REPT-81-9B6-ARCTI-R3 ..... N83-19892 #
REPT-81-25 ..... N83-20553* #
REPT-82-FM-52 ..... N83-20474* #
REPT-82-FM-65 ..... N83-20473* #
REPT-82-03-03-1 ..... N83-20775 #
REPT-82-613 ..... N83-20552* #
REPT-82SRD085 ..... N83-20098 #
REPT-1982-2 ..... N83-20801 #

REPT-018958-1-F ..... N83-19734 #
REPT-200712-3 ..... N83-19896 #
REPT-9199500-VOL-1 ..... N83-20600 #

RES/DEVELOP-REPT-53-VOL-3-PT-4 ..... N83-19863 #

RFP-3089 ..... N83-20279 #

RHO-BW-SA-189 ..... N83-20332 #

RL-82-042 ..... N83-19720 #

RNCSIR-82-03-03-2 ..... N83-20776 #

RR-136 ..... N83-20346 #

RSL-TR-331-23 ..... N83-19995 #
RSL-TR-343-6 ..... N83-20004* #

RSRE-MEMO-3517 ..... N83-20574

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R81-2 ..... N83-20046 #
R81AEG545 ..... N83-20709* #
R82-910002-4 ..... N83-20049 #
R82-955655 ..... N83-19851 #

S-74/1981 ..... N83-20717 #

SA-TR-82-33 ..... N83-20542 #

SAI-82-614-WA ..... N83-20520 #
SAI-82-687-WA ..... N83-20521 #
SAI-83-861-WA ..... N83-20519 #
SAI-254-82-318-LJ ..... N83-20787 #

SAM-TR-82-29 ..... N83-20449 #

SAND-80-7017-VOL-2 ..... N83-19956 #
SAND-80-7172 ..... N83-20394 #
SAND-81-0311 ..... N83-20113 #
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SAND-81-2054 ..... N83-19955 #
SAND-81-2081C ..... N83-20393 #
SAND-81-2561 ..... N83-19999 #
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SAND-81-7040 ..... N83-20768 #
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SAND-82-0511 ..... N83-20669 #
SAND-82-0664-VOL-2-PT-2 ..... N83-20755 #
SAND-82-0957C ..... N83-20388 #
SAND-82-1154C ..... N83-20387 #
SAND-82-1193C ..... N83-19877 #
SAND-82-7018 ..... N83-20750 #
SAND-82-8210 ..... N83-19898 #

SAO-SR-392-VOL-1 ..... N83-20846* #

SAPR-4 ..... N83-20718* #

SAR-6 ..... N83-20314* #
SAR-16 ..... N83-19726 #

SASR-1-3 ..... N83-20472* #

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SC5117.14TR ..... N83-19909 #
SC5117.15TR ..... N83-19909 #
SC5117.16TR ..... N83-19909 #
SC5267.3FR ..... N83-19719 #
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SD-TR-82-67 ..... N83-20086 #
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SD-TR-82-82 ..... N83-19913 #

SERI/PR-232-1511 ..... N83-20418 #
SERI/PR-233-1395 ..... N83-20417 #

SERI/TR-214-1362 ..... N83-20409 #
SERI/TR-252-1422 ..... N83-20403 #
SERI/TR-632-1354 ..... N83-20404 #
SERI/TR-98281-03 ..... N83-20395 #

SERIAL-T-467 ..... N83-20688* #

SETEC-CE-82-009 ..... N83-20304 #

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SGD-454-PT-2 ..... N83-20891 #

SIO-REF-82-24 ..... N83-20514 #

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SP82-MSFC-2591-VOL-2 ..... N83-20791* #

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SR-L3-04388 ..... N83-20318* #
SR-L3-04389 ..... N83-20320* #

SR-P2-04384 ..... N83-20321* #

SR-T2-04383 ..... N83-20322* #

SSD-81-0076 ..... N83-19801* #

SSD82-0172 ..... N83-20360* #

SSL-SER-ISSUE-2 ..... N83-20309* #

SSL-SER-18-ISSUE-60 ..... N83-20308* #

ST-25358 ..... N83-20576 #

STF65-A81022 ..... N83-19966 #

SU-STAN-CS-82-916 ..... N83-20818 #

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SU-TR-3 ..... N83-20643 #
SU-TR-323 ..... N83-20686 #
SU-TR-382 ..... N83-20816 #

SWRI-06-5382/4 ..... N83-20291 #
SWRI-6800-120/1 ..... N83-20161 #
SWRI-6800-124 ..... N83-19837 #

SWRRI-102 ..... N83-20357 #

TAEG-TR-130 ..... N83-20556 #

TDI-TR-82-5 ..... N83-20089 #

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TKK-F-A467 ..... N83-20175 #

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TPS-80-756 ..... N83-20744 #

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TR-4 ..... N83-19834 #
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TR-9 ..... N83-19841 #
TR-10 ..... N83-19840 #
TR-11 ..... N83-19842 #
TR-13 ..... N83-19909 #
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TR-15-9-82 ..... N83-20560 #
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TR-54 ..... N83-19833 #
TR-60 ..... N83-19850 #
TR-82-30 ..... N83-20675 #
TR-82-36 ..... N83-20684 #
TR-82-37 ..... N83-20673 #
TR-82-515 ..... N83-20571 #

TR-83 ..... N83-19787 #
TR-113-7 ..... N83-20594 #
TR-244 ..... N83-20498 #
TR-258 ..... N83-20685 #
TR-496 ..... N83-20667 #
TR-694 ..... N83-20657 #
TR-0082(2940-01)-6 ..... N83-20086 #
TR-0082(2945-01)-6 ..... N83-20014 #
TR-0082(2945-03)-3 ..... N83-19913 #
TR-0083(3945-11)-1 ..... N83-19811 #
TR-0083(3945-11)-1 ..... N83-19838 #

TRB/TRR-852 ..... N83-19961 #

U-OF-IOWA-82-22 ..... N83-20889* #

UCB/ERL-82/1 ..... N83-20016 #

UCID-19404 ..... N83-20752 #
UCID-19447 ..... N83-19918 #

UCLA-ENG-82-71 ..... N83-19991 #

UCRL-15451 ..... N83-20112 #
UCRL-15504 ..... N83-20430 #
UCRL-53302 ..... N83-20169 #
UCRL-53312 ..... N83-19938 #
UCRL-86707 ..... N83-20842 #
UCRL-87071 ..... N83-20299 #
UCRL-87219 ..... N83-20114 #
UCRL-87377 ..... N83-20785 #
UCRL-87378-PT-1 ..... N83-20753 #
UCRL-87378-PT-2 ..... N83-20754 #
UCRL-87455 ..... N83-20729 #
UCRL-87677 ..... N83-20770 #
UCRL-87720 ..... N83-20786 #

UDR-TR-82-99 ..... N83-19893 #

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UMS-PUB-57(CE-3) ..... N83-20546 #

UMTA-TC-06-0152-83-1 ..... N83-19888* #

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US-PATENT-APPL-SN-196877 ..... N83-20447* #
US-PATENT-APPL-SN-198093 ..... N83-20280*
US-PATENT-APPL-SN-212949 ..... N83-19949* #
US-PATENT-APPL-SN-248744 ..... N83-19737*
US-PATENT-APPL-SN-250585 ..... N83-20634* #
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